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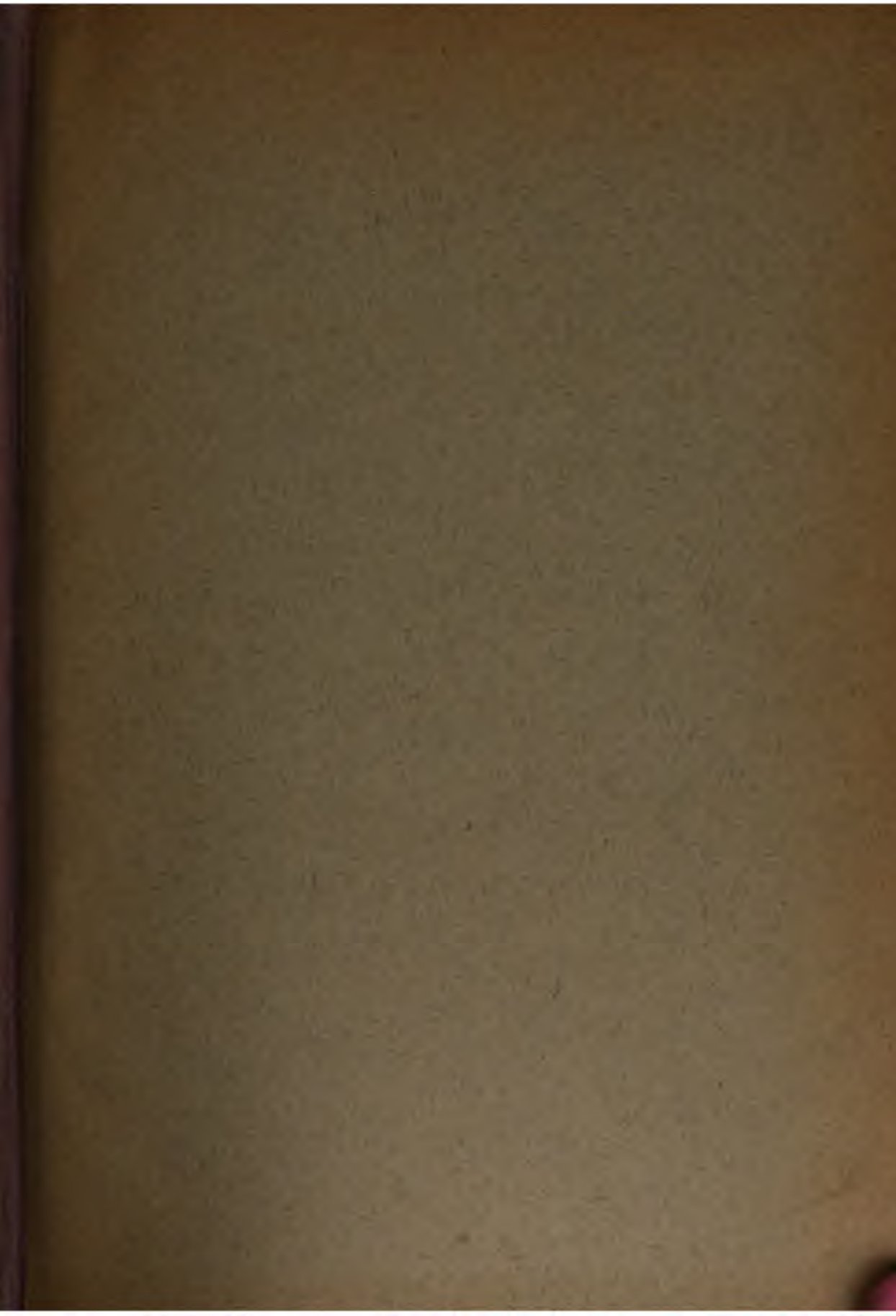
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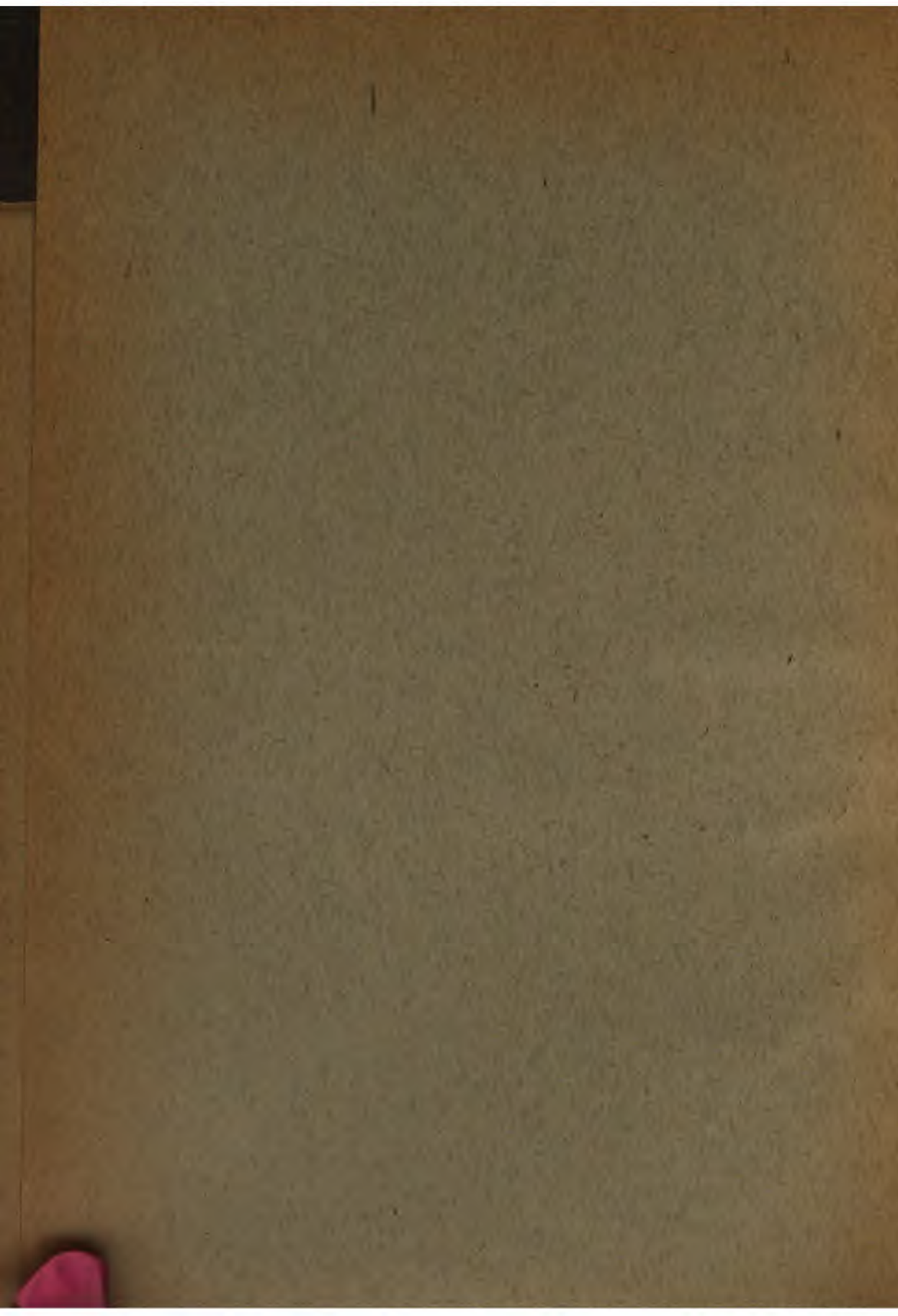
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ORIGINAL ARTICLES

POSSIBILITIES AND USE OF REMOVABLE LABIO-LINGUAL SPRING APPLIANCES*

BY GEORGE B. CROZAT, D.D.S., NEW ORLEANS, LA.

REGULATING appliances are mechanical devices for exerting force upon malposed teeth for the purpose of creating cell activity, and thereby causing the teeth to assume a proper position in the line of occlusion. Appliances are divided into two classes, fixed and removable. It is through the work of V. H. Jackson that removable appliances have been developed to their present usefulness. It may be said that it is possible to treat any type of malocclusion with removable appliances, although a number of varieties of malocclusions can be more successfully and more easily treated with this form.

Jackson, in his textbook on *Orthodontia*, states that it is possible to construct removable appliances with both base and noble metals and especially recommends the use of nickel silver and gold clasp in their construction.

I shall endeavor to show the possibilities of removable appliances constructed with clasp gold and iridio-platinum. These appliances will permit adjustments similar to the lingual arch appliances attached to molar bands either soldered or by a locking device. It is also possible to use the high labial wire with finger spring extensions found so useful in depressing protruding anterior teeth. By the combination of the labial and lingual springs, it is possible to rotate teeth in torsion and to move teeth both mesially and distally in the line of occlusion.

The attachment piece or cribbing device is sufficiently stable to resist the force exerted on the malposed teeth and admits of removal when necessary.

The appliances being constructed with noble metals are durable and easily repaired when broken. Changes and additions as the work progresses can be made by the free hand method.

*Read before the Alumni Society of the Dewey School of Orthodontia, St. Louis, Mo., March 6-8, 1919.

Among the advantages of removable appliances is that the teeth and appliances can be brushed thoroughly, and that they exert a mild, constant, painless pressure so essential in correcting malocclusions.

Fig. 1 illustrates a case of bilaterally distal relation of the lower arch, with protruding upper anterior teeth before and after treatment.



Fig. 1-A.



Fig. 1-B.



Fig. 2-A.



Fig. 2-B.



Fig. 3-A.



Fig. 3-B.

Fig. 2 shows a case of unilaterally distal relation with retruding and bunched anterior teeth.

Fig. 3 illustrates a similar case with the exception that the upper molars on the left side are in lingual version to the lowers.

Fig. 4 illustrates a case of bilaterally distal relation of the lower arch in



Fig. 4-A.



Fig. 4-B.



Fig. 5-A.



Fig. 5-B.



Fig. 6-A.



Fig. 6-B.



Fig. 7-A.



Fig. 7-B.



Fig. 8-A.



Fig. 8-B.



Fig 9.

which the protruding anterior upper teeth had been depressed without establishing a normal mesio-distal relation of the arches.

Fig. 5 is a case of neutroclusion with labioversion of the upper incisors.

Fig. 6 is the same case, occlusal view, showing expansion accomplished.

Fig. 7 illustrates a case of neutroclusion with bunched anterior teeth or a complex neutroclusion.



Fig. 10-A.



Fig. 10-B.

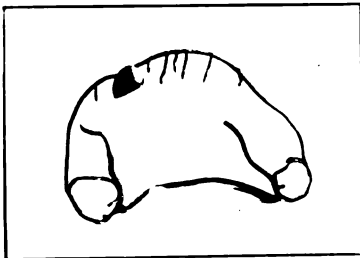


Fig. 11.

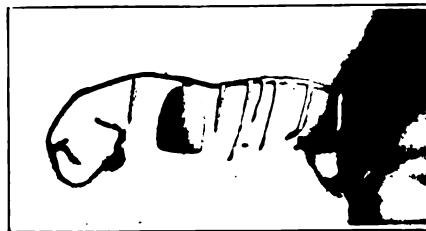


Fig. 12.

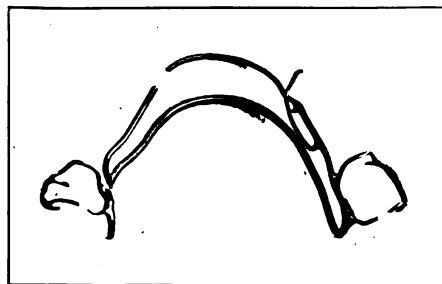


Fig. 13.

Fig. 8 shows lateral views of the same case as in Fig. 7.

Fig. 9 is a case necessitating regulation for bridge-work with excessive space for the restoration of an incisor.

Fig. 10 shows a case of bilateral distocclusion before and after treatment.

Fig. 11 is an occlusal view of the appliance used in the treatment of Fig. 9 in which the high labial wire carried an incisor.

Fig. 12, same appliance from the labial aspect.

Fig. 13, an example showing construction of a lower appliance.

DISCUSSION

Dr. W. F. Taylor, Fond du Lac, Wisconsin, was asked to open the discussion. He said: "As I have not used this appliance, I do not feel competent to discuss the paper. However, I wish to compliment Dr. Crozat on the beautiful results he has obtained with this appliance."

Dr. H. A. Pullen, Buffalo, New York.—I have examined a few of these appliances, and it seems to me they possess a good many features of an appliance with which many of you are familiar. For instance, let us take the appliance of Dr. Lourie which he has shown us, with a heavy labial arch with a fixed anchorage. This heavy labial arch is attached to finger springs somewhat after the manner Dr. Crozat has used. Dr. Lourie's appliance has a more fixed anchorage, but if you will recall the picture Dr. Crozat showed, the anchorage was made as nearly stable as possible with the removable appliance. There are no bands upon the teeth. The little spring he had next to the molars went over the occlusal surface, another one going around anteriorly, and I imagine that occasionally some other springs are used to help to hold the appliance in position. It relates itself as nearly as possible to a fixed appliance, giving to it as nearly as possible a fixed anchorage, with the exception of banding the teeth.

In my experience the nearer we come to the fixation principle in the attachment of an appliance, the more efficient that appliance will be.

If I had any criticism to offer, in regard to this appliance, it might be along those lines.

Dr. Crozat is using precious metals and he understands perfectly that a base metal appliance does not come up to their standard for appliances.

In some men's practices a removable appliance will work to advantage and in others it will not. I made the statement sometime ago, and I shall repeat it now, that removable appliances have in a sense become fixed, partly and mainly through the idea of making them as stable as possible, which tends to make them fixed. At the same time, you well know that in the evolution of orthodontia fixed appliances in a sense become removable, so that we have a peculiar state of affairs existing—a fixed appliance becomes removable, and a removable appliance becomes fixed. However, as I said before, the nearer we come to the fixation principle in the use of any of these appliances, the more efficient they will be, because if you have a fixed apparatus in the mouth you are quite sure that the appliance will not be taken out at meal times, laid on the table, brushed into the tray, or go into the wastebasket. A patient turning somersaults in the hay will not lose the appliance, neither will he take it out and put it in his pocket when he wants to eat candy. On the other hand, if the patient should eat molasses taffy, it would destroy an appliance of that kind and you would have considerable trouble in reconstructing it. All these points appeal to one who has had experience with that type of appliance. I have used them, and I have not given them up altogether. There are cases where they are very valuable and have some advantage; but so far as their universal use is concerned, they do not appeal to me as much as the appliances which have a more fixed anchorage.

The analysis of appliances along these lines I want to discuss in my paper, and describe the method of their analysis. I will attempt to analyze this appliance from the standpoint of the principles of anchorage. The first thing that appeals to me is the manner in which Dr. Crozat attaches his anchorage in the molar region, using that as a basal anchorage, and the next point is in analyzing the appliance from the standpoint of fixation which relates to any appliance. The basal wire itself is often part of the primary or basal anchorage, because it is made so heavy that it does not change in shape, and simply acts as a base of anchorage attachment for the spring arms.

The next point in relation to this analysis is the anchorage at the points of delivery of the forces which I have designated as secondary anchorage, which I shall attempt to describe in the use of my own appliances in my paper.

Aside from the technical discussion of the paper, I wish to compliment Dr. Crozat on his splendid presentation which I have enjoyed very much. From what I have said, I would not attempt to discourage him in the use of appliances of this kind.

Dr. Crozat (closing discussion).—In closing the discussion, I will take up some of the points brought out by Dr. Pullen. The fact evident is that all appliances are coming to the point of either being fixed with the removable idea or removable with some fixation principle. As example, consider Dr. Jackson's appliances which are referred to as a fixed removable type. Collars with the inclined planes upon the buccal aspect of the teeth are used to increase stability. Through the use of multiple attachments, the appliance is fixed because its anchorage is made secure. There is no form of fixed or removable appliance which has more secure anchorage than this form.

Consider the appliances used by Dr. Mershon, in which case they are fixed by the use of locking devices to molar bands. The advantages of this form are a mild spring force, simplicity, inconspicuousness, and that they can be removed for adjustment. Again a fixed removable variety, but not removable from the standpoint of the patient.

Another for consideration is that form used by Dr. Lourie, the high labial wire with finger spring extensions used in conjunction with the lingual arch. The patient can remove the labial portion of the appliance and place it upon a form of modelling composition. This is done to reduce the possibility of bending when out of the mouth; another fixed removable feature. In this instance, the ends of the high labial arch are anchored into horizontal buccal tubes on molar bands.

Removable appliances constructed with noble metals are not universal, neither do I think there is any appliance which is ideal and universal in the treatment of all forms of malocclusion. I have endeavored to use several forms of appliances and do not confine myself to the use of removable ones constructed with noble metals. I use this form where I think it can be used efficiently, accomplishing the result in less time and with less inconvenience to the patient.

An appliance to approach the ideal must be sufficiently durable as to last through the treatment or until such a time as the operator deems it necessary to change.

In using finger springs and lapping springs on the lingual surfaces of incisors, they must be of sufficient gauge so that they will not become distorted.

Regarding the question of losing appliances, if patients are inclined to remove their appliances for little or no reason, and probably lose them while turning somersaults in the hay or otherwise, I say that removable appliances are not intended for the treatment of those individuals. Few, if any, of the fixed varieties would resist such patients. For this reason the patient must be made to realize the consequences, and several punitive measures may be used to prevent such occurrences. Parents, guardians, and the children are generally very careful that the appliances are not lost.

PROPHYLAXIS IN ORTHODONTIA*

BY J. FRANK NELSON, D.D.S., CHICAGO, ILL.

IN presenting a paper on the subject of Prophylaxis in Orthodontia, no attempt has been made to bring out anything new or novel. I simply desire to call your attention to a few problems and conditions we meet in practice, and offer some suggestions for their solution.

Much has been written and taught in recent years disclosing considerable diversity of opinion, and conviction on the subject of prophylaxis. Many courses on instruction are offered to the student of the specialty, varying widely in theory and technic. A vast amount of material, equipment and instruments are to be had for the use of the operator. Consequently it has been truly said that there is prevalent a hazy conception of just what oral prophylaxis is, what it is supposed to do, where it begins and ends, what is the proper technic, and what constitutes a so-called prophylactic treatment. An analysis of the word "prophylaxis" answers all these questions except that related to technic. The word "prophylaxis" means, literally, "to guard before." Oral prophylaxis then means the performance of any operation, manipulation, interference, or procedure, designed to guard the teeth and adjacent tissues of the mouth *before* or *against* disease or abnormality. In other words, it is the purpose of oral prophylaxis to maintain a normal physiologic condition and to prevent the pathologic.

To be exacting the term "Prophylactic Treatment" seems to be a discord or misnomer for the reason that the word "Treatment" has long been associated with, and implies, disease, while prophylaxis is out of harmony with disease, and ends where treatment is indicated.

It could not be called an act of prevention or "guarding before" if one were to lock the garage after the car was stolen. The question of method or technic used in the practice of oral prophylaxis becomes largely one of personal preference on the part of the operator and the requirements of the case in hand. Like all other technical procedure the method or the instrument which would seem best and most effective in the hand of one operator, would not necessarily be so in the hand of another and it matters little, so the results are attained and oral health is maintained.

In some cases especially those of young patients prophylactic care may be started at once without preliminary treatment, but in most instances it is necessary to do a certain amount of preparatory work before instituting prophylaxis. This preliminary treatment consists of extractions where there are fragments of roots remaining, it consists of removal of all deposits, it consists of fillings in deciduous or permanent teeth, it consists of grinding and polishing all enamel defects, sharp angles of teeth, fillings or other restorations, it consists of the restoration of contact points and normal occlusion by fillings or orthodontic treatment, it consists of the treatment and restoration of normal

*Read before the Alumni Society of the Dewey School of Orthodontia, St. Louis, March 3, 4, and 5, 1919.

septal and periodental conditions. After the mouth has been placed in as nearly normal condition as possible by treatment, the patient should be instructed as to the daily care of his mouth and then placed on the list for prophylaxis. He should be required to present himself at regular intervals, the frequency of these visits depending on the individual case and the success of their daily care. Some individuals may go for five or six months and keep their mouths in very good condition, while others should have attention after that many weeks.

The usual procedure when a patient is given prophylaxis is very short, about half an hour. If it takes longer than that, they are probably waiting too long, and that is one of the best ways of arriving at the proper length of time between visits.

If there are any deposits, which there should not be if they come often enough, they, of course, must first be removed. This can be done with the minimum of disturbance to the soft tissue by scalers designed to be used with the draw or planing motion. All stains are disclosed by painting a few teeth at a time with disclosing solution, immediately rubbing and polishing with wood points, dipped in some harmless abrasive,—flour of pumice, silax, prepared chalk or some of the dentifrices. The spray should be used frequently during this operation, with some mild pleasant solution. Intermaximal spaces and under bridges, etc., can best be reached and polished by the use of tape or wide floss with a little abrasive carried with it. The surface under the free margin of the gum labially and lingually can be polished by the use of rubber cups, preferably the very small conical ones about the size of the business end of your porte polisher. They spread out nicely over the tooth and root and are very thin at the edge. The grooves and fissures on the occlusal surface of the molars and premolars can be cleaned and polished most effectively with stiff brushes, and those are the only surfaces of the teeth on which brushes can be used with safety. Much damage can be done to the soft tissues by the careless use of brushes in the engine.

There are cases where orthodontic treatment may properly be termed an oral prophylactic measure, especially when by interference with abnormal tendency during the developmental period the teeth may be guided into their proper place in the arch and occlusion, and normal proximal contact, and normal occlusion, produced.

An objection is sometimes offered against orthodontic treatment, arguing that it produces caries and gingivitis. No doubt there may have been cases where this criticism was justified, but it would be difficult to determine the truth of the accusation for the reason that from six to sixteen or eighteen years of age is the period in life when carious teeth are most prevalent whether they are receiving orthodontic treatment or not, and gingivitis may come from other causes, usually neglect of the proper use of the brush and floss. However, every precaution should be taken against injury to the teeth and membranes, both in the construction and manipulation of orthodontic appliances.

It would be folly to treat a case of malocclusion by the use of an appliance of material, which, by reason of its construction, composition, or operation, would so injure the teeth or supporting structures as to impair their functional value, or increase their susceptibility to disease, and thus defeat the object of the treatment.

First then we are concerned with the construction of our appliances. From the prophylactic standpoints they must be so constructed as to give the least possible interference with function or damage to the tissues and permit the greatest possible freedom in the care of the mouth.

Preliminary to orthodontic treatment the teeth should be carefully scaled and polished; a very stubborn case of gingivitis may be produced by a particle of calculus forced down against the membrane by a well made band. As few teeth should be banded as is consistent with the requirements of the case, using deciduous where possible. All bands should be carefully fitted, contoured and festooned so they do not impinge on the membranes. They should also be bur-nished nicely into the bucco-linguo and proximo-occlusal grooves to prevent slipping rootwise, in case cement should fail, and to avoid injury to lips and tongue. The ends of all spurs, springs and tubes should be nicely rounded and polished, arches and alignment wires should be kept away from the gum margin where possible, and either placed against the teeth or high and away from the gum margin.

The best appliance, for prophylactic reasons, is the high arch with finger springs. It gives the least disturbance of function, does not impinge on the gingival tissue, and permits the free use of brush and floss. Ligatures should be used with care to prevent slipping rootwise and injuring the membrane. If possible a reverse loop should be thrown around the tooth occlusally to prevent this. Certain materials are best suited for orthodontic purposes, for prophylactic reasons on account of their antiseptic properties. Some of their base metals or compounds containing copper possess this property. They may be less valuable, however, as to their physical properties than platinum which has no antiseptic value. This phase of the subject, however, is of much less importance if proper prophylactic care is exercised preparatory to and during orthodontic treatment. Some operators use the copper cement in preference to other cements on account of its supposed antiseptic properties.

The functions of the teeth should be interfered with as little as possible if we are to carry these cases through with a minimum of periodontal trouble. This would argue against the use of jackscrews and other positive appliances that fix the teeth and prevent functional movement. Prophylaxis in or during orthodontic treatment is of special value for the reason that it requires the construction of appliance of the highest efficiency, the minimum complexity, the greatest comfort, and least injury to the patient. The frequency of visits for orthodontic treatment gives opportunity for prophylactic care that should not be had otherwise, during the impressionable age of the individual, when the best habits of the care of the mouth may be formed, and an appreciation of their value realized, that will remain with them during life.

It will be necessary to do more than remind you that early orthodontic treatment together with the radiogram becomes a valuable measure in the prevention of certain malocclusions. Traumatic occlusion is no doubt the cause of more periodontal diseases than all other factors combined, and though much traumatic occlusion is the result of poorly constructed restorations, the large percentage is caused by malposed teeth with abnormal inclined plane relations. Abnormal

proximal contact is not only a cause of gingival and periodontal troubles, but contributes to the cause of caries as well.

It seems fitting also at this time to remind you of the importance of orthodontic treatment in general prophylaxis. Malocclusion through its effect on mastication becomes a causative factor in nearly all the disorders of the alimentary canal, plays a very important part in the cause of some of the diseases of the respiratory tract, and disturbs the functions of speech, to say nothing of its effect on facial development and deformity. Volumes might be written on any one of these subjects and I will not do more than call your attention to them and suggest that you read and study and think of these things.

Orthodontia is something more than the science of the movement of the malposed teeth; it is a subject of inestimable value not only in oral but general prophylaxis as well.

DISCUSSION

Dr. H. B. Hamilton, Ithaca, New York.—I do not know that I can say very much in connection with this paper because I am so fully in accord with everything that Dr. Nelson has said. I found soon after taking up orthodontia that prophylaxis was a very important part of our work, and I found in my work that it was perhaps of equal importance with the orthodontic treatment.

The one thing I was very glad to hear Dr. Nelson speak of was the use of brushes. That is something I have never used; I could never feel that I could use them without doing severe injury, and yet I find they are used quite generally. I had a supply man tell me within the last week that he had sold sixty dollars' worth of brushes to one of our prominent orthodontists.

The doctor mentioned the use of some base metal materials for banding on account of their antiseptic properties. I use these very largely, but I find there is one disadvantage in their use, and that is, on the teeth whose structure is a little below normal, there is a possibility of staining, and I never feel safe in leaving a band of any kind on for any great length of time. I have no doubt that in some cases where I get staining from the base metal materials I would get decay with other metals. The use of appliances which do not hold the teeth very rigidly is a splendid point and should be emphasized much more than the doctor has done.

The time between treatments I find varies very much. I have some patients for whom I never have to do prophylactic work; others need prophylactic treatment at every appointment. To me the use of a hygienist has been of the greatest importance. I have had one from the time they were legalized, and at the present time I do not feel I could get along without one. In fact, I feel so strongly in favor of it that I am having a member of my own family take the course at the present time, not with the idea of her doing the work, but to be prepared in case my present hygienist should leave me, by having some one to take her place temporarily.

I do not know that I can add anything further to the paper because the doctor has left so little for me to discuss.

Dr. A. C. Gifford, Oshkosh, Wis.—Dr. Hamilton spoke about giving prophylactic treatment each time the patient came. It would appear to me that removing the appliances, as would certainly be necessary for thorough prophylactic treatment, would tend to injure the gums more than perhaps some of the accumulations that had not been brushed off by the patient himself.

Dr. S. W. Bradley, Ottawa, Canada.—There is one point which Dr. Nelson brought out which I think was very good, and that was the contour of the bands put on the teeth that are being moved. In Dr. Angle's book he advocates a straight band because if you contour it, you will weaken it. I think it is bad practice not to contour the band in the interproximal space and escape the gingival tissues.

I use brushes once in a while, but I do not use the large ones. The small cup brushes I have are fairly soft, and you can clean stains from the teeth far better with them than with small rubber cups. The rubber cups should be used after the brushes to actually polish the teeth. The rubber cup I like best for prophylaxis is a small cup that spreads well out over the tooth and gets under the gingival margin. It makes a splendid cup to polish after using the brush and removing the rough debris. I like a powder best that does not fly all over and leaves a beautifully smooth surface.

You will notice when the permanent cuspids erupt, they are often very rough. Nasmyth's membrane on them seems to be tenacious, and if you are not careful with your alignment wire, and have it up close to the gingivæ you will have decay in a very short time. In two cases I have had decalcification. The enamel was white and chalky. I took a small fine Arkansas stone in the engine and ground that decalcified enamel right out and polished it, and I do not think there will be any further decay in that area.

Dr. J. A. McPhail, Blandchester, Ohio.—I believe this is the first time I have ever heard a paper on prophylaxis read by an orthodontist, and I congratulate the society on having Dr. Nelson read this paper, because he has specialized in this work for several years, and as we all know, he is a man of ability, and has given us this paper in a way that everybody can understand it.

I believe our first duty, when we take a case, is to clean up the mouth. There is no excuse for any practitioner working in a filthy mouth, and the first thing to do is to clean it up; take out the old roots and what is necessary and do it at the start.

The second thing is to teach the patient how to care for his mouth. There is not much use on your part of doing all the work and the patient doing little or nothing. We get these patients at a time in life usually when we are bound to make an impression on them, and we can never tell with a little patient just what things will impress him the most.

I remember a few years ago of working for a lady who was seventy years of age, and I congratulated her on her beautiful set of teeth, and she told me that when she was a child her parents lived in Paris, and they had a friend who was a portrait painter. He was taken sick and she accompanied her mother to the hospital, and they brought flowers to the artist, and the artist asked her to come over and sit opposite him as he was in bed. He asked her if she knew what two things were necessary for a beautiful picture, and she was unable to tell him. He said to her, you could not have a beautiful picture without beautiful eyes and beautiful teeth.

Now, what is the use of spending probably a year or more in trying to give a patient a beautiful set of teeth if that patient does not take care of the teeth after spending years of work and much money. I think we can start with the children. You can not have a child for a year without making some impression on him. Children will like you or hate you, so that ultimately you will have to get a divorce.

I think all orthodontic work is really prophylactic work, and all orthodontic appliances should take into consideration prophylaxis.

I think it is very fortunate for orthodontists that in the National Dental Association we have a Section on Orthodontia and Periodontia where we can be drawn together. Naturally we are going to receive a great deal of criticism from these periodontists, and unfortunately we are deserving of some of it. I think they will stimulate us to take a greater interest in prophylaxis. We ought to do it anyway, but they will keep at us until we have to do it. I believe all treatment of malocclusions will improve a patient's health, but what is the use of trying to correct one condition and bring on another, such as pyorrhea, because of ill-fitting bands and many cumbersome appliances that were made years ago. I think oftentimes it is the case of jumping out of the frying pan into the fire; you get rid of the malocclusion but you have developed a nice case of pyorrhea. I prefer having a slight case of malocclusion to having a case of pyorrhea. It is unfortunate sometimes that when we take cases of children that caries will develop very rapidly and we get the blame. So I think we ought to start in first with prophylaxis and keep everlastingly at it as long as we have the case.

Dr. Nelson (closing).—One of the gentlemen spoke of an oral hygienist. For my own part, I prefer to do the work myself. That may be a personal reason, but I have

a feeling that I can get better results. I feel that I could not get a girl or a nurse I would trust to do this work. It is too important to trust to others.

Something was said about the inconvenience of doing prophylactic work with an appliance on. A good time to think of that is while you are making the appliance. Sometimes a minor change without interfering with the function of the appliance will aid you greatly in your prophylactic work. I rarely ever take off bands in doing prophylactic work. I take advantage of a band or bands being off to do prophylactic work occasionally, but ligatures or removable parts, wires, etc., can be removed easily. Take off everything you can, but so far as that is concerned I do not believe it interferes with or is an excuse for not keeping the mouth in good prophylactic condition.

Grinding the enamel is a good thing to do if you use good judgment. Although I spoke of enamel grinding, it was for the purpose of arresting enamel defects and preparing the mouth for prophylactic treatment.

I believe that is all I have to say.

HISTORY OF ORTHODONTIA

(Continued from page 674, Vol. V.)

BY BERNHARD WOLF WEINBERGER, D.D.S., NEW YORK CITY

J. H. MAGRUDER in the September *Dental Cosmos* 1889 introduced *A New Regulating Device*.—"The appliance consists of a strip of gold plate, 26 gauge, three-sixteenths of an inch wide and about two and a half inches long. At intervals corresponding to the width of the upper oral teeth holes the size of a No. 3 bur are drilled through the strip, and at each end, opposite each other, two smaller holes are to be made. Two pieces of gold wire, say 20 gauge, are then soldered to the strip near its end and so placed that the wires will overlay the holes and the free ends nearly meet in the middle of the strip, as at *A* in the illustration (Fig. 1). It will be observed that each wire is soldered only at one of its ends. Suitable rubber bands are then slipped over the wire, a piece of floss silk passed through each band, the ends of the silk put together and pushed through the holes and appear as shown at *B*. The number of bands will of course depend on the number of teeth to be moved. The appliance as illustrated may be adopted to the drawing or pushing of irregular oral teeth into line, but it is preferable to form the strip upon a cast of the case so the holes may be drilled at points corresponding to the anchorage teeth and to the positions into which the other teeth are to be brought. Ligatures through the end-holes will serve to secure the plate to the bicuspid or other anchorage teeth. The bands should be as thick as may be to act in separating as well as drawing the teeth. By suitably

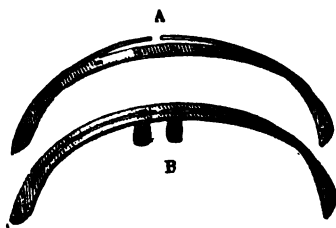


Fig. 1.

bending the plate it may be made to bear on the tooth or teeth which are to be moved inward, and thus the plate will both push and pull in effecting the regulation.

"For holding the teeth until firmly set in their new positions, I employ a gold wire very carefully fitted and tied to each tooth with sterilized silk ligatures.

"The appliance described is simple, effective, and occupies the least possible space between the teeth and the lips, which are not liable to be chafed by the plate because the bands or ligatures lie very close upon the plate over the wires, as is made obvious by the illustration."

W. G. A. Bonwill's "*Method of Correcting Irregularities of the Teeth*" has already been described, but we find in *The International Dental Journal* for 1889

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further studies and new appliances along these lines. Bonwill says he discarded his previous methods, they being:

"My first essay on orthodontia was written in 1862. To make my own history more replete, however, it is necessary to show what I have done in this line of work since 1854. As the apparatus was then entirely new and the practice considered rather radical for the time, and as it has since been revived by others, I shall briefly present them here.

"From the following language it will be seen that the 'Coffin plate' of rubber was anticipated by me, except that I used silver wire made spiral, and adjustable or detachable from the plate previous to 1862.

"If the inferior jaw, I clasp, where possible, and when not, strike up a plate to cover the deciduous or permanent teeth, as they may be, and operate from this. From the inward inclination of the inferior bicuspid and molars (or molars alone of the temporary set) there will be sufficient firmness gained by making it to press outward at these points.

"If there are no other means of holding it in the inferior jaw, an india-rubber plate made to fit accurately either the teeth or palate, or both; and if you desire, the surface of the vulcanized plate can be roughened to enable the patient to masticate thereon, and screw the spiral springs into this.

"This I seldom use, being bulky and dirty, and far more liable to injure the faces of the teeth. More can be done with the spiral spring soldered to a metal plate.

"The same principles of action I still adhere to; namely,

"1st. To commence as soon as possible after the seventh year, or as soon as there is evidence of decided irregularity.

"2d. To watch all children's teeth from the third year and determine by an exploring needle, every three months, the exact position of the coming permanent teeth as soon as the first permanent molar has appeared.

"3d. To preserve, by early treatment, the first and second molars—temporary—even to the treatment of their pulps, if the little patients are not brought in time to obviate it.

"4th. To be sure the first permanent molars are preserved without loss of pulp, and to allow nothing to interfere with their full and free development in the arches, as upon these teeth more than upon any others are due the irregularity, from coming too forward in the arch, from decay of approximal surfaces of temporary molars, or from the tardy eruption of the permanent incisors. The six-year molar drives the arch into smaller space when the incisors have appeared out of or inside the arch.

"5th. That all apparatus should be simple and, if possible, firmly fixed, so that the patient can have no control over it; and then see the case every few days.

"6th. That constant and uninterrupted pressure is preferable. The antagonism of the opposite jaw will always be exerting a force to make them move back and forth in the sockets, and this makes sufficient intermittent pressure.

"7th. That while one plan, without some change in each case, will not do, yet the infinite number of apparatus is a greater nuisance to patient and operator.

"8th. That the impressions of both jaws in plaster and a duplicate from the first; so that the plaster teeth can be cut off and rearranged to see the effect, and

these models placed in the anatomical articulator, where they can be studied in the lateral movements, so necessary. That this shall be studied carefully; and, before action is taken, have the patient call and study the case in relation with the plaster model; and if doubt exists as to the extraction of a tooth or teeth, better postpone a few days and send for patient again rather than make so great a blunder.

"9th. That a tooth shall be held as sacred as an eye; and, while extraction is sometimes demanded, when the greater good of the patient is at stake—when of weak constitution—yet do not too hastily resort to it.

"10th. That without the combined assistance of parent and child better not commence.

"11th. That nothing shall be withheld from the child or parent, but every detail, every risk, and the amount of patient endurance needed, the long time, and, when all is corrected, to allow of stay plates, that the work gained may be retained.

"12th. Not least of all the factors, you must place such valuation on your services as will insure your interest and will drive the parties concerned up to their duties.

"To these points I would now further insist on the great importance of utilizing as factors or fulcrums the temporary molars.

"1st. By shaping them with a disk on all their sides or surfaces, so that a gold clasp can be securely placed thereon.

"2d. Where only a ligature is needed, to cut a groove with the disk on the buccal and palatal and lingual surfaces near the cervix, in which to place the silk ligature to keep it from working down under the gum.

"These teeth will soon be lost, and no injury is done by shaping and grooving them.

"3d. By the use of gutta-percha, warmed and placed on the palatal or lingual side of the tooth, around which a ligature is to be placed and carried slightly up over the grinding surface to prevent the ligature from pressing down under the gum. This I use on permanent teeth.

"4th. Where the tooth can not be cut or gutta-percha used, then gum sandarach varnish or a thin solution of oxyphosphate zinc placed on the tooth will prevent the ligature from slipping when the tooth is being rotated, or to keep it from pressing up under the gum.

"5th. The immense importance of the anatomical articulator, with the geometrical and mechanical laws governing it.

"The study of this alone will lead to the anticipation of so many irregularities, and will teach one to begin very early. It shows how invariable is law; and, when violated, where the cause is and how to obviate it.

"It shows what is an archetype, and demonstrates clearly how the highest efficiency is reached in the equilateral triangular jaw of man, and that nothing can be made more perfect either by nature or by man."

The appliances used by *Bonwill* in 1889 are described in the following manner:

Fig. 2 represents a curved bar made of platinized gold with four holes punched for the passage of silk ligatures. It is another way of applying Fig. 3, without band, and is used mostly for a single tooth in either jaw.

"Fig. 3 is this same bar with a clasp on one side of the arch. The bar is lengthened beyond the clasp to allow of the rubber tubing, tied at *B*, being attached far enough away from *A* in order to give sufficient power to move the teeth desired.

"It was applied, Fig. 4, by clasp[ing] a first molar where the right central had to be twisted, and the lateral also, but in opposite directions. The bar rests upon the mesial buccal edge of the lateral while the silk ligature is carried twice around the central, bringing it up next the lateral, and is now drawn through the rubber band which has been tied opposite the molar. The rubber is stretched to the full length of the bar. The cuspid was also drawn outward on the same bar by boring a hole directly opposite, which was made to twist the cuspid as well as to draw it outward.

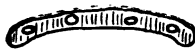


Fig. 2.



Fig. 3.

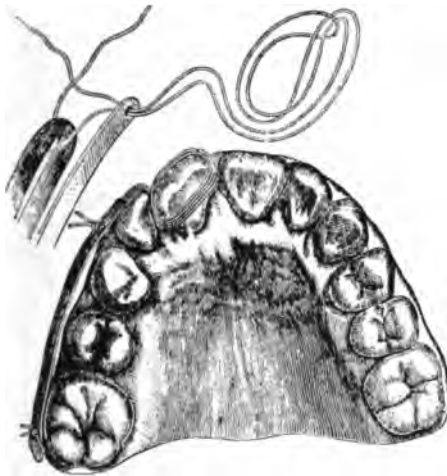


Fig. 4.

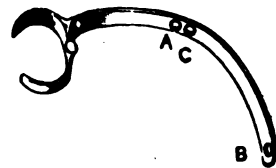


Fig. 5.



Fig. 6.



Fig. 7.

"Fig. 5 is the same bar applied for drawing out both superior laterals and expanding the arch.

"The gutta-percha stay-plate (see Fig. 6) is for keeping the ligature off the gum at the cervix, on the first molar. A piece of pink base-plate gutta-percha was warmed and pressed up against the molar, letting it rest partially on the adjoining teeth; when cold, two holes were made in it for the passage of the ligature, which was tied on the buccal surface of the molar. A rubber band was tied to the inside before adjusting. A ligature was then cast around the right lateral, carried up between it and the cuspid, and over it through the space where the first bicuspid was extracted, on the lingual side of the first bicuspid, and tied to the rubber band attached to the gutta-percha stay or helmet on the first molar, and stretched over the buccal surface of the cuspid. This drew the lateral out very forcibly. The arch was first expanded by the fixture shown in Fig. 7, made of piano wire, with half clasps of platinized gold at *AA*, made with small ears to

rest on the grinding surfaces of the first bicuspid to prevent slipping down upon the gums. These clasps were soft soldered to retain the full temper of the piano wire as a spring. It is a very cheap and easy way of making such an apparatus and with a powerful spring which such cases demand.

"Fig. 8 is another modification of Fig. 5, the single bar, and is applied in Fig. 7, where the four superior incisors are to be moved forward from one-fourth to three-eighths of an inch and the whole arch expanded to meet the more perfect and larger arch in the lower. It is made of two flat bars of platinized gold sliding over each other for at least two inches. A loop is soldered to the end of each flat bar as guides to hold them in place while sliding through. A rubber band is shown attached to the end of each bar at *AA*, which, in contracting, enlarges the circle, and consequently not only throws out the incisors, but the bicuspid and cuspids as well.

"The attachments are made on either side to a molar or a bicuspid, owing to the ease of claspings. I have utilized the decay on the anterior surface of a molar by filling with amalgam, and cutting a hole for one end of the bar to rest in instead of using a clasp.

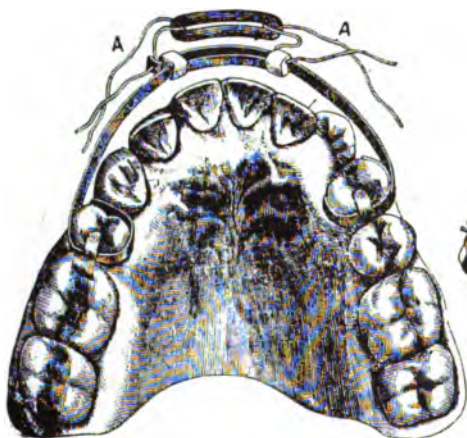


Fig. 8.

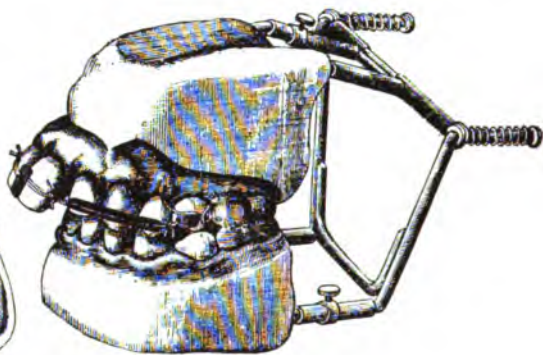


Fig. 9.

"Before the apparatus is placed permanently in position, the incisors are ligated with a loop, using gum sandarach varnish to prevent slipping or turning on the tooth. The ligature should be so adjusted as to twist the tooth, if needed, while drawing it forward. These are then tied to the sliding bars, bringing them closely in contact with all the teeth in the arch. The rubber band is then tied between the two points, and the application is complete. It is easy to see not only its simplicity, but also its great effectiveness. It can be used equally well for contracting an arch.

"Fig. 9 shows the worst case of protrusion of the upper jaw I have ever seen. It did not arise from an acquired habit, nor did it have any precedence in heredity. The temporary teeth had proper arches. No cause could be assigned. They came as you see in Fig. 9. The lower incisors, when I first saw the case, were three-eighths of an inch from the superior incisors on their palatal surface, and were imbedded in the gums on the hard palate.

"Before attempting to draw in the incisors I made a rubber plate (Fig. 10) to cover the hard palate, thickened where the lower teeth would touch, and opened the jaws at the bicuspid at least one-eighth of an inch. This was not only to drive the inferior incisors up into their sockets, but also to allow the bicuspid and molars to come down and antagonize before the plate was removed. Two years were consumed in this. To this plate was then attached a rubber band carried entirely around the arch with a silk ligature, and a metal hook, with two holes, was carried over the cutting edge of the central incisors, through which the ligature passed. This kept the ligature down on the incisors near the cutting edges, and while it was aiding in drawing in the arches, it did another important thing: forced the centrals up into the alveolus. This was done by the tendency of the rubber band to work up towards the gums, and at the same time it pressed them up and made them shorter without grinding. This was a case parallel with the one delineated by *Dr. Kingsley in Oral Deformities*, but without any of the treatment given there. A gold band, running over the arch from the second bicuspid, which was soldered to clasps around the latter, and which could be adjusted or removed by the patient, was used to secure it in position.

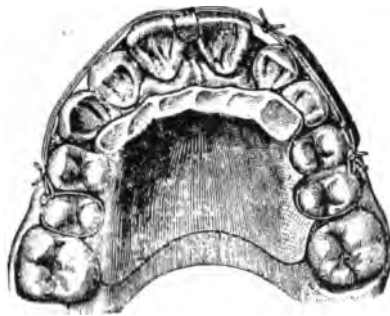


Fig. 10.

"The explanations of geometrical law, and the value of the anatomical articulator in showing how the first permanent molar plays so important a part in making the lower incisors roll over one another, and thus make the smaller arch with a very deep under and overbite where seen. I am almost quite ready to say never extract the first permanent molar. Keep down the inferior incisors. Have the first permanent molar take its place soon and rapidly in the arch. Drive it backward toward the ramus rather than have it move forward to make the underbite too deep."

"To a person of any comprehension these are simple devices and plain rules; the application can be made to any case of irregularity. Any one can surely make the apparatus. Whoever hereafter shall undertake this branch of practice should first read my article on the geometrical law of articulation and study the principles involved, and not attempt wildly to do what but few men have ever truly fathomed. Really, in every city, some one should make of this a special practice, and the profession should encourage such by sending cases for inspection and consultation. And such a specialist should do all he can in return to teach by example and demonstrations by clinics, to enlighten those who are placed so far from large cities that they are compelled to take such cases. When we can have

that understanding between us, then we may feel as banded brothers more fully equipped for these hitherto difficult and almost thankless operations."

In the *American System of Dentistry* 1887, vol. ii, page 486, Dr. Bowwill contributed a chapter on *The Geometrical and Mechanical Laws of the Articulation of the Human Teeth.—The Anatomical Articulator*.

"After more than thirty years of active life in dentistry I am fully persuaded that all that constitutes dentistry proper the mechanical forms the basis. And yet to make anything that is beautiful in our art, especially in vying with nature in matching the teeth, we must be more than mere mechanics, more than capable of filling a tooth or treating an abscess; we must be dental artists. When we introduce a set of teeth upon which depends so largely the expression of the face from the soul beneath, we must bring to our aid not only the laws of mechanics and geometry, but the beauties of art. It is not enough that we accurately adapt the plate to the gums; that we so grind the teeth to the plate as to be water-tight; that we so make every joint that it can not be distinguished; that we so polish the plate over symmetrical curves that the tongue can not find the least fault. We must do something besides this: we must impart *action* to these otherwise whited sepulchres; we must instill life therein or our labor will be in vain. A tooth may be elegantly shaped and colored, yet if it lacks the proper shape for the person for whom it is intended and is unskilfully set in the arch, it is a failure. The blocks from the same mould set by different operators may vary in effect in every case. For this the operator should have a number of blocks of the various shapes, colors, and sizes, and try them under the lips until his judgment tells him which to use. The dentist's taste can be so cultivated that he will be apt to criticise his own selections.

"I shall use the term 'articulation,' instead of 'occlusion,' for the very good reason that it is more in keeping with the functions or the motions of the jaw. If there was but one movement of the lower jaw, and that up and down, we might possibly say occlusion. But this latter term applies more properly to the shutting of the lips or closing the mouth, and not to the motion of the lower jaw dependent on the articulation of the same at the glenoid cavity, where the articulation is universal. Articulation is a word of action throughout, while occlusion answers to the mere act of closing the teeth and lips and keeping them closed; one is active, the other passive. Before we can comprehend, then, what constitutes true articulation of artificial teeth, we must look at the anatomy of the human jaw and its functions.

"We find from twenty-eight to thirty-two teeth in each jaw, arranged in such manner that no two strike directly against each other, but antagonizing in such a manner as to prevent the whole denture from becoming very irregular, which would be the case if striking one against another. By this arrangement, when one tooth is lost the regularity of the arch is interfered with. As necessary as this is in nature, it is not positively necessary to follow it in artificial work, although for the sake of harmony it should be done.

"It will be found in 95 per cent of cases that the upper teeth project over the lower, and that the depth of overbite varies as the depth of the cusps of the bicuspids are deep and shallow; the ramus will be found to come upward and backward in relative proportion to the length of the cusps and the overbite.

"One point of very great importance has not been given in general or special anatomy: *The peculiar tripod arrangement of the lower jaw, forming an equilateral triangle.*

"From the center of one condyloid process to the other four inches is about the average; and it will be found that from this same center of the condyloid process to the median line at the point where the inferior centrals touch at the cutting edge is also four inches. It is strange that it should have been overlooked; but it only shows when studied in a geometrical and mechanical sense, the great wisdom in our formation. It varies, but never more than one-half of an inch, which would make no difference in describing an arc of a circle. No matter what the width from the processes, the distance is the same to the median line of the lower jaw. Were the lines of the angle five feet, the teeth made in the anatomical artic-

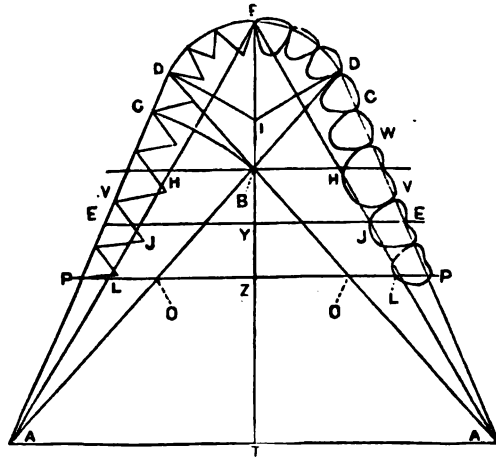


Fig. 11.

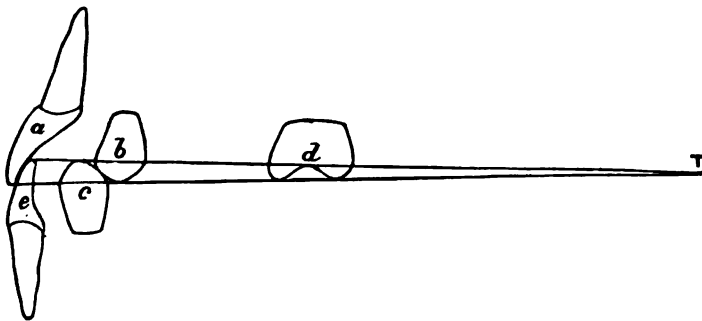


Fig. 12.

ulator would fit the case. It will be perceived that in setting artificial teeth, one-fourth of an inch, the radius of the circle, would not materially alter the articulation. Without such an arrangement the teeth would have to be flat on their grinding surfaces to admit of lateral movement. Besides, there would not be the beautiful and wise curvature at the ramus for equalizing the force applied to the teeth in all directions.

"Imagine the human jaw jointed in a line with the pharynx, or as is seen in the ordinary brass articulators. Can it be supposed that there would be greater wisdom displayed in such hinging or articulating a part destined to such varying motions and powerful wrenching force? No! The study of this one part of the head and jaws shows one of the most striking designs of an architect; and when studied it will be seen that every part of our frame is made by a positive law and to subserve definite purposes, such a law being in consonance with geometry, physics, and mechanics. We must see the true use or function of the jaw and the teeth and the food destined for us, and how it should be comminuted; there is no chance work about it! Law and order pervade every part. The jaw forms a perfect triangle, for the purpose of bringing into contact the largest amount of grinding surface of the bicuspid and molars, and at the same time to have the incisors on one side at once come into action during these lateral movements.

"It will also be found that from the cuspids, the bicuspid and molars run in nearly a straight line, instead of a curved one, back toward the condyloid process, enabling them to keep the largest amount of surface always presented for mastication. Another thing which has never been explained by anatomists or naturalists is the law of the normal relation of the upper to the lower incisors. The normal jaw should overjet, and also have a corresponding underbite. Without such a law the incisors would lose largely their functions, that of incising on the principle of a pair of scissors. Where the incisors strike directly upon each other the power to cut off food would be very much lessened. The length of cusps on the bicuspid and molars proves the law.

"Another unobserved fact: where law is supreme, where there is an overbite and underbite just in proportion to their depth will be the length of the cusps of the cuspids, bicuspid, and molars.

"By drawing two lines from *T* to *F*, Fig. 11, or *T* to *A* and *E*, Fig. 12, we have the lengths of the cusps of the bicuspid, *B*, in the upper and *C* in the lower, and also *D*, the second upper molar. The depth of the underbite is one-eighth of an inch from the cutting edge of the inferior central incisor *E* to that of the superior central incisor *A*. Did the teeth extend as far back as *AA*, there would be flat surfaces at those points. But in articulating artificial teeth, when the superior second molar is reached its distal cusp has to be raised from line *TE* to *TA* (Fig. 12), to allow the molar teeth on the opposite side, not in mastication, to touch, for merely balancing the plate, otherwise the second molars would be of no use in lateral movement, nor would the first molars. This curvature at the ramus commences at the first molar, although it shows itself slightly in the bicuspid. Practically, it need commence at the first upper molar. This curve, then, will always be proportioned by the underbite at *A*, *E*. The length of the cusps and bicuspid will never be more than an eighth of an inch, normally; the groove deeper than that would cut the palatal cusp off, and make of it a cuspid. It would in reality be cut in twain. *This is another unobserved fact. It always has been and will be found in the archtype of human jaws.*

"So that when a first superior bicuspid is seen it can very well be told from the length of the cusps whether the jaw from which it came had a depth of underbite of one-sixteenth of an inch or more. Where the teeth all strike fairly

one upon the other, without overbite, then there is no occasion for cusps. If originally there, they would soon be worn off from the abnormal articulation.

"This provision of articulation is most wise, carrying out still more fully the exact law by which the anatomical movements of the lower jaw for perfect mastication are governed. So beautiful and mathematical a design can not but call forth our admiration and wonder, and the study of no other part of the human body will give one a clearer idea of infinite wisdom. This movement, we will find in the artificial sets arranged upon this law, will prevent the plates from tilting. In the natural denture the incisors are really the first teeth to be arranged, though the first molars emerge first to assist in the more perfect mastication of food and to keep the jaws at the proper distance. The incisors show a definite fixedness of purpose to arrange themselves after their typical shape, and to form the overjet and overbite at a given depth for the accommodation of the bicuspid and molars, which are soon to appear, having cusps of a definite length, so that the law of articulation which has been premeditated to a certain typical shape and construction be carried out.

"It will also be found that the grinding surfaces of the bicuspid and molars have a typical shape, allowing them to meet with all their surfaces touching, for an express purpose, after a preordained and established law, from which the greatest area is gained for mastication, and that the inner cusps of the lower teeth are as necessary as the outer of the superior when laterally moved. The law is still farther carried out in the curvature at the ramus from the second bicuspid to the third molar, to permit of all the surfaces on one side to be in contact, while the other unused side is only partially so. The nearly straight line of arrangement from the cuspid to the last molar is also in keeping with the underbite (Fig. 12). It may well be asked, just where, "Will the law hold good in an artificial articulator such as I use, applied to the setting of artificial teeth?" As soon as the attempt to apply this principle is once made, the operator must certainly grasp this law, so wise and beautiful. There may be variations, but the general law will hold good, and where there has been much latitude or varying from it by abnormal mixtures of races or types, if Nature is given fair chance to right herself she will return to the normal standard of mathematical and mechanical precision: to do otherwise would annihilate creation. *Cells free to arrange themselves must develop the original creation, and perpetuate and keep it to the perfect standard, by selecting the highest type of perfection in shape, strength, beauty, etc.*

"Could the reader but stand beside me while I arrange a set of teeth in this articulator, he would of necessity become converted to my system as founded on law and not on chance. There is no other part of the human body that will permit of thus handling and unfolding, and again rearranging—no other that stands outside its own organic workings that will permit such demonstration. It is the key to the revelation of Nature's inner workings, and unfolds, without a *missing link*, what we were, absolutely perfect in cell and organism from the inception, and simply in conformity to an indefinite and all-wise law which can not be blotted out. The teeth individually, have been a great factor in science; and when they can be looked at from the point of view therein laid down and hitherto undeveloped, their significance will be magnified; and if we, as dentists,

but take up the work as only belonging to our specialty, and scientifically prosecute it, our honors and standing will be enhanced.

"This triangle can only be found within a perfect circle in which there are the greatest breadth and area of surface. No other geometrical angle would have given such perfect beauty and symmetry to the face. The compactness brings the largest number of teeth nearest the center of motion. The double joint permits the greatest strength and the easiest lateral movement, with the greatest range of this at the least expense of power and compass. It permits the largest number of teeth to antagonize at every movement; *and, not least of all, this very triangle is the means by which Nature develops the typical shape of the ramus and of the formation of the jaws, the underbite, etc.*

"This form of triangle is necessary, again, for the purpose of giving the largest number of muscles a chance to act on both sides simultaneously and concentratedly, thereby keeping the circle or arch of grinders down to their work and equalizing the pressure on all sides. It enables the teeth on the side where the chewing is being done to arrange themselves when erupting so that they will be very nearly in a line with the left condyle, which is now passive on this side, and forms one point of the dividers in forming the arc of a circle; and by this condyle being where it is—four inches from the other—the molars and bicuspsids, as well as the central at that side, all come in the most perfect contact for chewing and incising, thereby carrying out this absolute law of Nature of the perfect adaptation of geometry and mechanics to her uses, and having no lost motion or function in any part.

"Again, the triangle gives an extra motion forward which brings the lower teeth in contact with the upper to incise or cut off food presented there. The type has been preordained, just as has the nose or the peculiar shape of the eye or any other part of the body. If in the arrangement of the teeth in the human jaw no type or design were laid down in conception or embryonic life, what malformed creatures we should be mentally and physically! *And it will be found that just in proportion as there is congenital insanity or want of will or directing power, there will be a malformation in the arrangement of the teeth, while in shape they are perfect.*

"*The Equilateral Triangles within the Main Triangle.*—The outline drawings in Fig. 11 may be thought *ideal*. But any one at all acquainted with geometry, who has followed me in my argument and description, must be struck with wonder at the marvellous ingenuity of the contrivance based alone on the equilateral triangle. It will be seen that perfection must be the result, since each part is complete within itself and the whole supporting each individual part.

"How have I arrived at this divination? The law is based on the measurement of over two thousand human skulls. First, make an equilateral triangle 4 inches each angle, A, A', F ; draw a line from T to F . What is the guide to form the arch? Know the actual width of the superior central, lateral, and cuspid at their greatest diameter from mesial to distal surfaces—say $\frac{13}{16}$, as in Fig. 11. Measure this off with the dividers, and place one arm at F , and describe an arc from D to D through I . Then place dividers at I , and intersect the line just made from F , and it will be found that at D will be the extremest point of the arch D, F, D , and will be the distal surface of the superior cuspid.

Place the dividers at *I*, and describe the arc from *D* to *D* through *F*, which will constitute the normal and positive arch of the superior jaw. There will be an equilateral triangle from *D*, *F*, *I* on either side of the mesial line at *F*. The same will be found the base of each superior incisor.

"Next draw a line from *A* to *D* on either side, which will be the guide for the bicuspid and molars as to width and depth. Then by placing the dividers at *A* and *B*, describe another arc to *C*, which will give the width of first superior bicuspid. The line from *A* to *D* passes through its palatal base, and will pass through centre of base of triangle of this tooth.

"Form another triangle by drawing a line from *H* to *H*, through *B*, which will pass through the center of the first molar, and will give the width between their palatal surfaces or their depth or thickness. Placing the dividers at *I* and *F*, we intersect the line from *F* to *T* at *Y*. Draw a line through *Y* to *E*, forming another equilateral triangle. From *B* to *F* is now the radius of another arc, which intersects the line from *D* to *A* at *V*, and the line *A* to *D* at *O*. A line now drawn from *E* to *E* through *Y* intersects the center of the second molar at *E*, *E*. Get half the distance between the points at *E* on the line from *D* to *A*, and the width of the first molar is made, and also the second, which is the angle of the equilateral of each. This leaves room between the first bicuspid and first molar, and is the width of the second bicuspid: or it is shown by placing the dividers at *A* and *Y*, and intersecting line from *D* to *A* at *W*, same as from *B* to *C*, for the first bicuspid's width. The distance from *D* to *D* is the same as from *D* to the distal surface of the second molar. *P* to *P* through *Z* forms another equilateral triangle, giving the wisdom tooth's place in the arch.

"The arrangement on the left shows the teeth in the act of mastication, while on the right the inner cusp of molars of the upper and outer of the lower molars come in contact when not in use. There is double the surface touching at every lateral movement.

"In conclusion, let me again impress all with the importance of cultivating mechanical art in our calling; for I can assure the reader that it will pay tenfold in increasing his usefulness as an operator in every department, and in giving him powers of conception, and lead the way to original ideas and more practical development."

Before the *World's Dental Congress*, 1893, *Bonwill* continued this investigation under the title of *What Has Dentistry to Demonstrate against the Hypothesis of Organic Evolution*, and made the following thirteen claims:

"Claim 1. That the human jaw and teeth show, beyond doubt, the workings of absolute laws which gave them the highest efficiency and from which organization there could be no change except retrogressive, not progressive; not to a higher form.

"Claim 2. The human jaw is based for its organization and workings upon the principles of the equilateral triangle, which, as well, underlie the shape of every tooth and the numbers to occupy that equilateral space.

"Claim 3. Given the length of one arm of this triangle, say four (4) inches, and it can be shown from this alone how, whatever or whoever made the first human jaw, that with a pair of dividers and a straight edge the size, shape, and number of each tooth in both upper and lower jaws and their absolute places

therein were made; and further what should be the exact arch containing the six incisors in both jaws and the action in mastication and incising of food.

"Claim 4. That the human jaw is no exception to this rule. That the proportions of the human body were founded on the equilateral triangle and unless so, no fitter organization could have ever existed or been brought into being nor could it ever have been reached unless by the same rule at the very beginning of its existence.

"Claim 5. That if the hexagon cell of the bee, which cell existed before man, is incapable of change to make it fitter for the object for which it was designed, then we can claim it as a precedent that the same principle in the human jaw is none the less true and demonstrable.

"Claim 6. I claim not only to have discovered the laws by which organizations are made, but have perfected the drawings from these laws by which any skilled artisan or mechanic can reproduce and duplicate, artificially, what the working model here presented demonstrates and its action shows beyond doubt the highest efficiency in such an arrangement, based simply on the principle of the equilateral triangle.

"Claim 7. If the human mind can not conceive of a fitter organization than what is here demonstrated, and produce it from the laws and principles of evolution, then there can be no progression to a higher state that can form a basis of argument for the evolutionist.

"Claim 8. That as no one can show any fraud in this work and the claim of "an ultimatum having been reached" by a human being, it must follow that Nature, who had the first chance at the building of organizations, must have done her best and made the fittest in the beginning.

"Claim 9. It is claimed that natural selection could only have reproduced a preexisting organ or organism or previous type and could add no new organ or alter the form of the preexisting one to higher efficiency.

"Claim 10. That mechanical means, which can only be externally applied, can not even reproduce an existing type, let alone form an additional organ or organism.

"Claim 11. There is no proof that when any organ has once been lost that it has ever been reproduced in the same animal; in the progeny, the same organ will again appear, but nature will patch up in order to prolong life, but never in one life time make the effort to ever reproduce the lost organ, or lay the foundation in the offspring to make an additional organ either like the original or make one of a higher efficiency.

"Claim 12. The human jaw (to the glory of dentistry) furnishes one of the strongest or most absolute proofs of Claim 10 in the reproduction of the temporary set of teeth, which when completely lost at the age of fifteen, again appear in the offspring when there was no such organism existing at the time of procreation to give birth to an entirely new temporary set in that offspring.

"Claim 13. The dental apparatus affords the best proof of the workings of a practical scientific workman from preexisting laws, and nothing but intelligence and a personality could have ever conceived and made such organs and organisms, and no further proof is needed of the purely scientific productions given in this discovery.

M. Siegfried in the *Deutsche Monatsschrift für Zahnheilkunde*, 1889, page 184, explains his *Methods of Correcting Irregularities of the Teeth* by the use of the *Coiled Springs*. Figs. 13 to 18 illustrate this principle. Again in the *Dental Cosmos*, 1896, page 497, Siegfried's appliances are described by R. Runschenbach.

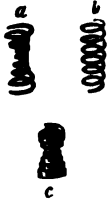


Fig. 13.



Fig. 14.

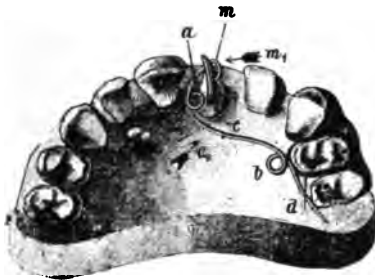


Fig. 15.

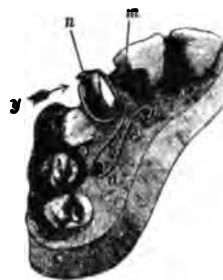


Fig. 16.



Fig. 17.



Fig 18.



Fig. 19.

"To Draw Receding Teeth into Position.—A nicely made band is fitted to the irregular tooth. This done, a piece of wire is cut and soldered to the band, and the end of it bent up so as to form a hook, see Fig. 19a. The prepared band is now firmly cemented to the tooth. After this, separate the two wings

of the spring, slip the spiral on the hook *b*, and finally the end of it is bent over, so the spring of it is prevented from slipping off.

"Retraction of a Tooth."—As will be seen, this is a case where a forward growing cuspid is to be pressed backward. Here we have as a driving force only one wing of the spring.

"The band is fitted to the second bicuspid, and as shown in Fig. 20, *c*, a piece of half-round wire is soldered to the band on the lingual surface, starting from the first molar and ending at the first bicuspid. By this arrangement the spring is supported by three teeth. On the labial surface two wires, bent at right angles, are soldered, Fig. 20, *d.e*.

"Thus prepared, the apparatus is cemented to the second bicuspid. The spring is then placed on the bent wire *d*, and the end of the wire *e* is bent over



Fig. 20.



Fig. 21.



Fig. 22.

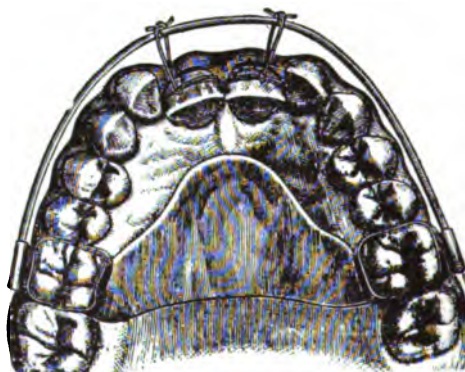


Fig. 23.

again to firmly hold the spring. The wing *f* of the spring exerts its power against the cuspid.

"To Rotate One Tooth in Its Alveolus."—In this case (Fig. 21), we use both wings as a driving force. This apparatus has much likeness to that just described, as it also consists of a band with a support soldered on the labial surface.

"After this device is fastened with cement on the first bicuspid, we at first turn the wings of the spring over one hundred and eighty degrees. Now we put the spiral on the hook *h*, so the wing, *i*, will press on the distal side of the tooth to be regulated, and operate in the direction of the screw *x*, Fig. 21.

"A silk ligature is now attached to the tooth, and the knot made on the labial surface. One end of the spring is drawn through the eye of the wing *k* and

fastened with the other end of the string to another knot, and the wing *k* will draw the tooth in the direction of the arrow *y*, Fig. 21. In this way the tooth is turned with perfect equality of action on both wings of the spring.

"To Turn the Teeth at the Same Time.—Among the many forms of dental irregularities the following cut, Fig. 22, represents one which is very common; the central incisors being situated more or less at right angles at the line of the arch. Both teeth are encircled by a well-fitting band. A hook is soldered on a little back of the space between the central and lateral incisors.

"Now the bands are fastened with cement, and we only have to put the regulating spring into use. The wire ends are to be turned over again. The arrows in Fig. 21 show the action of the spring."

E. C. Kirk, page 907, *Cosmos* 1891, *A New Regulating Device*. "The following contribution to the list of devices for correcting one of the more frequently

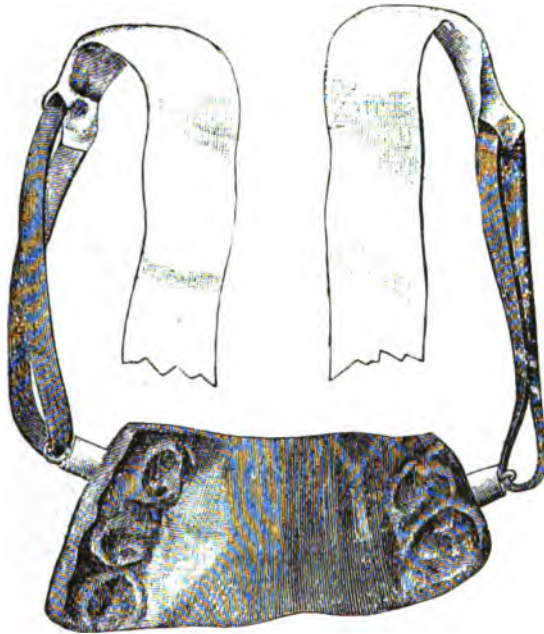


Fig. 24.

occurring forms of dental irregularities may be found useful. I have obtained very satisfactory results with it in the two cases where I have used it. The object to be accomplished in both of these was to move the incisors outward for the purpose, in the first instance, of increasing the size of the upper arch, and in the second instance, where the upper central incisors closed inside of the lower incisors, of correcting this defect.

"The appliance (Fig. 23), is constructed as follows: A broad clasp of plat-inized gold is thrown around each of the sixth-year molars, the opening of the clasp being at the distal buccal angle of the tooth or on its distal approximal surface. These clasps are yoked together by a narrow silver plate simply to give solidity to the fixture and cause the two molars to act as a single abutment. Upon the buccal aspects of each molar clasp is soldered a section of gold tubing about

three-eighths of an inch in length; the tubing used is the hinge-tubing of watch-case makers. The distal end of each tube is closed with a drop of gold solder. When the appliance is thus far completed, it is placed upon the model and a section of piano wire bent to conform to the arch, impinging upon the buccal aspect of the teeth about the middle of their crowns. The length of the piano-wire spring and the relation to its curvature to the labial aspects of the incisors is made such that its form will be that which the arch of the anterior teeth is to take and permanently retain, or, in other words, the wire is to be bent to the form of the arch which it is desired the teeth shall form when the correction is completed.



Fig. 25.



Fig. 26.



Fig. 27.

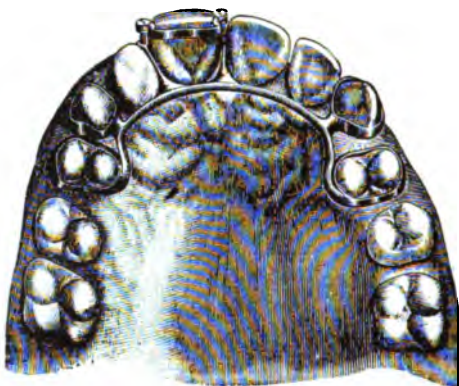


Fig. 29.



Fig. 28.

"The wire will now be approximately a U shape. The three extremities of the wire are to be cut to the proper length, so that when introduced into the tube-sockets with the fixture in position in the mouth the arch of the U will stand nearly one-quarter of an inch anterior to the incisors and about the middle of their crowns. After the fixture is adjusted in the mouth, the teeth to be moved outward are to be firmly ligated to the piano wire by means of fine gilling-twine or silk. The especial advantages of this fixture are that it is cleanly and easily removable for readjustment or cleansing. The traction force is exerted directly

outward in the median line, or if desired its direction may be modified by tying the ligature to the wire on either side of the tooth to be moved. The amount of force exerted is absolutely under control, and may be modified at any time by changing the length of the legs of the U-shaped wire, or by using a wire of smaller diameter, or by the method of tying the ligature to the wire.

"Not the least important advantage of the appliance as described is, that by having proper regard for the curve of the spring and length of its sides in relation to the curvature of the corrected arch, the fixture becomes practically automatic from the fact that the limit of resilience of the spring is reached at the moment the irregularity is corrected. Consequently, when the work of correction is done, the spring ceases to act. I have found much satisfaction in the use of electro-gilded piano wire not only in the cases described, but wherever I have occasion to use piano wire in regulating teeth. The deposit of gold is amply sufficient to protect the wire from oxidation during a reasonable time while in use in the mouth, and the unsightly staining of the teeth by iron salts is thus avoided. The gold surface is also an advantage when it becomes necessary to unite lugs, loops, or other fixtures to it by means of solder."

Henry N. Dodge, Cosmos, 1891, page 1045, Reciprocating Tooth Movement.

"It is now necessary to protect the tooth from contact with the lower incisors, for the diameter of the root where they touched it was much greater than the corresponding thickness of the upper left central. To keep the jaws asunder, therefore, an old upper plate which has been made for this case but discarded was now hastily cut down so as to cover the upper molars only, and as it was impossible to make it hold fast, two gold screw-eyes—convenient things to have at hand—were inserted into it, one near each angle of the mouth. The angles of the mouth were protected from abrasion by a bit of rubber tubing slipped upon the shank of each screw-eye; an elastic ring was put in the eye of each screw, and a ribbon fastened to each elastic; these two ribbons, tied at the occiput, held the plate in position. This plate is shown in Fig. 24. As soon as practicable this fixture, somewhat uncomfortable during mastication, was replaced by a lower plate, covering the molars, passing across the lingual surfaces of the lower oral teeth and reinforced by a half-round wire of platinized gold passing across the labial surfaces of the incisors and cuspids. The upper surface of this plate articulated with the upper molars, rendering mastication comfortable. The next problem in the case was to devise some appliance sufficiently powerful to force this conspicuously elongated tooth back again into its place. It was useless to rely on any fixture attached to the molars; they were even too short to support any appliance controlled by an occipital bandage. An occipital bandage attached to the tooth alone seemed to me crude, and ungovernable, and likely to result in injury to the tooth by displacement or irregularity and lack of delicacy in its action. *Dr. Herbst's* method of securing an implanted tooth by a strip of rubber-dam covering the crown of the tooth in question, perforated and slipped over the adjoining teeth and tied to their crevices, occurred to me; but these incisors had no crevices, and were too short to afford any such fastening. In this dilemma I concluded to make gold caps fitting the three unbroken incisors and cement them fast to the teeth, having first connected the three caps by gold wires passing across in front and back of the mended tooth, leaving an inter-

vening space around it. Upon each of these wires were soldered three gold buttons, as shown in Fig. 25.

"After allowing a few hours for the cement to harden, the patient returned and a strap of elastic rubber was made with three small holes punched in each end. These holes were slipped over the buttons at the front and back of the tooth, so that the elasticity of the rubber might force the tooth into place. The stretching of the rubber at the button-holes, however, made the appliance unsatisfactory, and several modifications resulted finally in the powerful combination of rubber strap and screw.

"The strap could be readily removed for cleansing and replaced in a moment, and by means of the key the nut could be turned as directed at the patient's home. The operation of this appliance is shown in Fig. 26."

Again in 1898 in the *Dental Cosmos* under *Reciprocating Tooth Movement: A Sequel*, Dodge wrote:

"I now present to the *Odontological Society*, at the request of its honored secretary, a sequel or appendix to the article previously published in the *Cosmos*.

"The left incisor has indeed grown, but not so much as was expected, the length of the teeth of the patient's parents being the criterion.

"I herewith present for examination two regulating appliances which have been used for the correction of the position of the mended incisor since the publication of my report of the case in 1891. Figs. 27 and 28, of which two views are shown, proved to be very powerful for the purpose of pushing up the incisor when the cuspids and bicuspid had grown enough to afford a fastening for the appliance. Fig. 29 was used for the rotation of the incisor back to its normal position, and its operation was faultless. The appliances will explain themselves on examination."

THE CONTACT POINT—ITS RELATION TO THE GENERAL HEALTH*

BY WALTER R. HUGHES, D.D.S., OAKLAND, CAL.

WEBSTER'S INTERNATIONAL DICTIONARY defines a contact as being the property of two curves, or surfaces, which meet, and at the point of meeting have a common direction. It is taken from *contigere* and *contactum*, to touch, a close union or junction, a touching or meeting.

The Standard Dictionary gives contact as the coming together of two bodies in space; or touching or meeting. The tangency of two surfaces or lines or one object with another.

The Century Dictionary uses contact as opposition of separate bodies or points without sensible intervening space. The act of making one body abut against another.

Thomas' Medical Dictionary defines contact as derived from *con*, together, and *tango, tactum*, to touch. The state of two bodies that touch each other.

Dr. Black defines the contact point as being a point on the proximal surface of a tooth which touches a neighboring tooth. In the first volume of his work, page 86, he further states: "In studying the buccal view, it will be seen that points of near approach of surfaces are very narrow and rounded in form from occlusal to gingival so that the actual touch point of unworn teeth is very small, like that of two marbles coming in contact, while in the view of the occlusal surfaces, the points of near approach to each other are shown to be much broader in bucco-lingual direction."

Bromell in defining the "interproximate spaces" says: "In the mesio-distal direction the crowns of the teeth are broader at their occlusal surfaces or cutting edges than at their necks." This bell-shaped form of the tooth crowns causes their proximate surfaces to touch at a point which is usually near the cutting edge. He also states "that the teeth of some types have a slight point of contact while those of other types cover a greater extent of tooth surface."

In Johnson's *Operative Dentistry* reference is made similar to this, "near the occlusal margin the surface is full and rounded, giving a point of contact for the proximal side."

All writers upon this subject agree that the contact points of the normal denture are similar to tiny little knives which assist in excising the food and directing it through the embrasures. A true contact point, then, has theoretically position but not magnitude. Not only do the contact points assist in triturating the food, but also each normal contact tends to take up the strain, stress or shock incident to masticating the food and transmit a part of the force to the adjoining teeth, so that each tooth will not battle alone.

The shape and color of the teeth blend with the complexion so that the mouth should have a harmonious relation with the other features. The con-

*Read before the Alameda County Dental Society, December, 1918; The Contra Costa County Dental Society, April, 1919; The Central California Dental Association, May, 1919. A revision of the paper of similar title which appeared in *The Pacific Dental Gazette*, June, 1919.

touring or rounding out of the teeth to form contact points upon the mesial and distal surfaces lends much to the characteristic beauty of the individual. It is this deviation on contours that renders the architectural appearance of the teeth different from a civil war cemetery with stones set all in a row.

The functions of the contact points are: to act as knives in excising the food during mastication; to act as shock absorbers or buffers, taking up and transmitting the shocks to prevent injury to the soft tissues; to assist in maintaining



Fig. 1.—The contact point when viewed from buccal to lingual.



Fig. 2.—The contact points of the teeth. Buccal view.

the occlusal plane; to retain the mesio-distal width of the interproximal spaces; and to add to the appearance of the possessor.

Now let us consider the following forces that act to destroy the points of contact, and study methods for their correction.

1. Malocclusion.
2. Loss of contact by extraction.
3. Interproximal wear.

4. Faulty dental operations.

5. Plus contact in one jaw.

1. Malocclusion. Angle says: "Malocclusion of the teeth is the perversion of the normal relations of the occlusal inclined planes of the teeth when the jaws are closed." The pleasing symmetrical and beautiful lines of an artistic, intelligent face may be drawn into a deformity of ugliness, if the teeth are in malocclusion. Often the perpendicular development is greater in one portion of



Fig. 3.—The contact points of the teeth. Occlusal view.



Fig. 4.—A loss of contact caused by the lower cuspid being deflected outside the normal alignment of the tooth. Note bone absorption at gingivæ.

the arch and causes an unequal strain or stress in that particular region. It is a common experience to find one or more teeth misplaced in either buccal, labial or lingual occlusion. However, any form of malocclusion will cause a loss of contact. Angle has laid down a rule which is applicable to general dentistry as well as orthodontia: "The best harmony and best proportion of the mouth in its relations to the other features requires that there shall be the full complement of

teeth, and that each tooth shall be made to occupy its normal position." Thus, if the operator in general practice should notice the teeth to be erupting out of their proper alignment, then it should be his duty to either correct the malocclusion himself, or send the patient to a specialist of orthodontia.

2. Loss of contact by extraction. What a noticeable inharmonious expression exists when a patient has lost a tooth or teeth. But the patient has suffered more than the immediate loss of the dental organ. If the operator does not insert an artificial substitute to retain the teeth in their proper relations, in a short time there will be a loss of contact of the teeth in that locality as well as those in the opposing jaw. The tooth without an opponent is extruded from its alveolus or deflected from its normal position, and as a result the contact either mesially or distally is lost. Whenever there is a loss of contact between two teeth the food crowds into the interproximal space and causes soreness and pain in that locality. This pain experienced by the patient while eating, rather increases the tendency to bolt the food, partly masticated. On the other hand, the lack of trituration of the food will tend to result in stomach trouble and allied complaints, thus jeopardizing the patient's health. It is plainly to be seen, then, that the loss of contact between two teeth, not only is a great discomfort to the patient, but causes inflammations to stomach or intestinal tract and allied maladies may en-



Fig. 5.—To restore the contact and occlusion for a few teeth a small removable bridge is made with a clasp on either tooth and a lug resting upon the occlusal surface of adjoining teeth.

sue together with the deeper inflammation of the area around the affected teeth which later may develop into a very stubborn case of pyorrhea alveolaris. The operator can best appreciate the value of the contact points if he has the efficiency of a few teeth impaired by the loss of contact points.

3. Interproximal wear. It is estimated that the length of the arch is shortened about one centimeter for a patient about forty years of age, by wear upon the interproximal surfaces. The interproximal wear increases as the patient advances in age. There is a continual pressure exerted upon the teeth to maintain them in their relative positions. Each tooth has a slight individual motion in its socket. This tooth movement occurs each time the patient closes his teeth. The interproximal wear is the result of slight, but continual, tooth motion. These wears occur upon the teeth performing the greatest amount of work, frequently being exaggerated upon molars and bicuspid where the biting stress is the heaviest. If these wears continue unchecked for an indefinite time, the result will be an injury to the gingivæ. The continual lodgment of food between the teeth will either cause a beginning of decay in the gingival area or set up an interproximal irritation in the soft tissues which finally results in pyorrhea alveolaris.

The contiguity of the approximal surfaces of the teeth greatly favors the retention of food and the harboring of microorganisms. How much greater the liability both to decay and pyorrhea when the food is allowed to crowd past the contact point.

The treatment for such cases suggests itself. The need for eradication of this fault in the dental apparatus is more emphatically impressed upon the operator if he has been a like sufferer. But in passing a subject of such importance the writer wishes to emphasize the necessity of wearing a separation of gutta-percha for from one to ten weeks or until a filling can be made with a normal contour. This may be either a gold foil filling, an amalgam filling, or an inlay, as the case in hand may demand.

4. Faulty operations. Too often the mesio-distal measurement of the arch is shortened by faulty dental operations. Fillings are made with no contour. Sometimes fillings are seen that do not approximate each other with any semblance of a contact point. Yes, sometimes approximal fillings resemble a letter S in appearance. Such operations should be removed and base-plate gutta-percha placed in the cavity until the required interproximal space has been secured.



Fig. 6.—An upper lateral incisor is deflected lingually, and held in malocclusion by the lower cuspid.

This space must be wide enough to insure a normal contour to the finished operation and a free circulation of blood in the gingivæ at this point. The best result will accrue to the operation if the gutta-percha is changed every three or four days until the distance between the teeth will permit a finished operation to be made.

If much looseness has occurred to the tooth a gold inlay makes the best material to use, or a good silver amalgam would make an ideal second choice. The Crandall method of amalgam contours insures a perfect result when used with caution. Whether this or some method equally good is used care must be observed to finish the amalgam into nicely rounded contours and insure a perfect contact point.

5. Plus contact points. The plus contact point is frequently noticed with the lower six anterior teeth. The lower jaw seems relatively too large for the upper jaw. When the patient closes the jaws the lower teeth occlude too hard against the upper front teeth. This causes the upper front teeth to lose their contacts and finally results in their separating in that ugly fan-shaped appearance. It

seems almost impossible to restore the beauty to the mouth when this has taken place. When the individual tooth-pattern of the lower teeth is a little too wide for the segmental outline of the upper denture or the interproximal wear has been greater upon the upper teeth or probably no wear has taken place upon the lower teeth a pressure is exerted too great for the labial plates of bone of the



Fig. 7.—The contact point was destroyed by the extraction of teeth mesial to the molar. As a result of the loss of the mesial support fibrous foods would crowd into the interproximal space and injure the tissues resulting in pyorrhea alveolaris.



Fig. 8.—The early loss of the first bicuspid caused an arrested bone development in this region. As a result there was an unequal biting stress placed upon the lingual surface of the upper central incisors and labial surface of those of the lower jaw. Note the absorption.

upper and lingual plate of the lower. This causes a bone absorption and finally results in pyorrhea in both localities.

A treatment for this case might save the front teeth of both jaws if taken in time. With a "lightening strip or disk" reduce the width of the lower teeth. The treatment if stopped now would be only partly successful. With a good

stone also reduce the length of the lower teeth until the articulation is as near normal as can be made. After the occlusion and contacts have been reduced to as near a normal condition as possible, polish the teeth.

If one hopes to successfully treat pyorrhea one must observe these three cardinal principles or the pyorrhea treatment will not be successful. The three conditions of a perfect treatment are:

1. Thorough root surgery must be performed.
2. Proper occlusion must be maintained.
3. Correct points must be retained.

If you fail in one, you have failed in all. The manifestations of foci of infection upon roots of teeth will not be completely obliterated.

It is asked, "why bother with so small a thing as a point of contact?" In this bundle of sticks are thirty-two pieces of wood. If each is taken separately only slight force is required to break it yet when the thirty-two are "en masse" it would require many times more force to break the bundle than when each is



Fig. 9.—Loss of proper contacts between lower incisors due to a crowded condition which was induced by an early loss of upper right first bicuspid.

taken separately. So with the teeth. Each tooth braces its fellow. The teeth are held apart by the contact points. While the contact points approximate each other with some degree of force, yet there is sufficient room at the gingival to allow a free circulation through the soft tissues and to give a protection to the pericemental fibers. On the other hand, should the contact points become flattened or destroyed by approximal wear or by caries the approximating teeth would touch each other with flat sides or surfaces which would tend to cut or injure the delicate fibers and cut off the circulation at that point. Not only, then, is the normal contact of the teeth on their approximal surfaces essential for lateral support, but the correct contacts are found equally necessary for the protection of the gingival tissues during mastication. Therefore, a restoration of a normal contour affords protection to the delicate gingival tissue by preventing the lodgment of food in the interproximal spaces. This bridging over of the interproximal space by the contact points renders a protection to the gingival

tissues and assures a normal circulation, protects the pericemental fibers and as a result assures health to the part.

In studying the anatomic formation of the teeth it is observed that nature has placed the contact points on the approximal surfaces of the teeth to outline a natural form to the particular tooth. It is architecturally formed to perform the functions assigned to it. The incisors and cuspids are given forms to excise or cut the food, while the bicuspids and molars are produced in forms best suited to grind the food. It is also observed that the contact points are placed upon the tooth surface in such a manner as to lend comfort to the possessor and add a useful life to the teeth. Another function of a perfect point of contact is to



Fig. 10.—An undue pressure upon the lingual surface of both upper lateral incisor and distal surface of the cuspid caused a bad pocket in this region. A pathological condition developed between the bicuspid and molar on account of bad filling in the distal surface of the bicuspid.



Fig. 11.—A lingual view of same case. Note bad pocket between bicuspid and molar, and wears upon incisal margins of front teeth. This tends to destroy contacts.

lessen the liability of decay upon tooth surfaces or to render them immune to decay. When making operations upon the approximal surfaces of the teeth the operator should, as far as possible, make a replica of the normal contour and of the points of contact, thus rendering a very useful service to his patient. The original contour should be added to the flattened or worn surface, and the carious tooth restored to a requisite contour if the patient is to have everyday comfort and as far as possible be rendered immune to disease of the gingival tissues.

Health is the greatest asset that the human body can possess. It should not be jeopardized by faulty dental operations. In balancing accounts or taking stock of our conditions it is observed that health is the most valuable of all things

possessed. It is said that 60 per cent of the ordinary diseases of the human family are caused by lack of attention to the mouth. A duty which every dentist owes his patient is to advise the services which when rendered, will maintain him in as high a standard of health as possible. On the other hand, should the patient be in ill health or not quite up to the normal standard of health, see if a faulty or leaky contact may be held accountable for his condition. Correct contact points are just as conducive to good health as the food that is eaten or any precautions the patient might take to defeat sickness. Correct contact points are the links in the chain that lead to good health, but if one of the links is broken, it not only leads to a loss of teeth, but is a causative factor in the production of oral sepsis. Look well to your contacts.



Fig. 12.—The efficiency of the mouth is lost on account of the destruction of the occlusion and loss of contacts.



Fig. 13.—The locking of the bite and unequal biting stress caused a loss of contact of all the lower teeth and resulted in pyorrhea alveolaris universally about the mouth.

Dr. Charles H. Mayo said: "It is evident that the next great step in medical progress in the line of preventive medicine should be made by the dentists. The question is, will they do it?" Now that the dental profession has a full knowledge of the physiologic functioning of the mouth as an important organ of the bodily economy, we readily observe that the duty of the dental profession is not simply one of "mechanical repairs." But its duty to the healing art is to make those "mechanical repairs" as near a replica of nature as human skill will permit.

There is no pathologic difference existing between a case of tonsillitis and a suppurating condition of the gingivæ. These septic conditions of the gingivæ are often induced by a loss of the contact points. The great surgeon of the day recognizes sepsis as the most potent factor of infectious disease found. The dentist will go a long way in aiding the physician to check the cause of a large

number of diseases by making operations upon tooth surfaces which will not maintain a hidden cause of oral sepsis. The missing link in the chain of evidence which has deterred the physician from making the correct diagnosis may be septic dentistry. Is it any wonder then that the physician, knowing himself defeated in his diagnosis and treatment of many diseases, on account of oral sepsis, desires the dental surgeon to meet him on terms of equal responsibility? The dental profession must realize the fact that the continuance of the patient in good health depends upon the underlying principles of oral antisepsis. Whether it be follicular tonsillitis or suppurating gingivitis, the pathologic condition is the same, namely, sepsis. The responsibility of the dental profession to the general health of the patient rests in making operations in the mouth which will not be a source of septic infection in the mouth or a source of sepsis to the body. Therefore, make your approximal operations with contact points sufficiently strong to insure the health to the surrounding tissues.

In orthodontic operations an endeavor should be made to obtain as near a normal occlusion as the case will permit. The retainers should be maintained until sufficient bony substance has been deposited around the roots of the teeth to retain permanent contact points between all the teeth. The operator will go a long way toward preventing the occurrence of pyorrhea alveolaris later in the patient's life by reducing the long cusps and widening the narrow sulci. This, if observed, will prevent the locking of the bite which becomes so disastrous if not corrected. Another invaluable service is rendered the patient having a great difference in measurements of the two jaws by reducing the contact points of the jaw having the greater measurement. This will also reduce the predisposing causes of pyorrhea to a minimum. All this is a material aid to the orthodontist in maintaining healthful permanent interproximal spaces with good contact points.

DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

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CLEFT PALATE AND HARELIP

BY VILRAY P. BLAIR, A.M., M.D., F.A.C.S., ST. LOUIS, MO.

WHEN Nature fails to close one or any of the facial clefts at the normal time, then the earlier her work is completed by the surgeon the better, from the standpoints of appearance, health, function, and mental development.

APPEARANCE

Fig. 1 is sufficient argument to dispose of the question of appearance.

HEALTH

Long observation has convinced me that those children with open lip and palate clefts are more subject to respiratory infections than normal children, and unless the most intelligent care is exercised, their nutrition is not as good.

FUNCTION

Here this chiefly refers to one of our important equipments for life's battles, speech. The earlier the cleft palate is repaired, the better will be the speech for that individual.

MENTAL DEVELOPMENT

Mental development depends largely on our intercourse with humans, and defective speech is a greater or less handicap.

The results desired are normal appearance and normal function, or the nearest attainable approximation to them. These can not be accomplished by surgery alone, but to reach the greatest perfection, or often even an acceptable mediocrity, the intelligent cooperation of the surgeon, the teacher trained in the correction of speech defects, and the orthodontist is required. As the work of the surgeon is the foundation upon which the other two will work, his aim should not be to simply close the clefts, but also to leave the normal anatomy as little disturbed as possible. The teeth and nerve supply should not be crippled or the maxillary arch unduly distorted. Contraction of the nasal fossæ is one of the worst things that can happen to a growing child. Any or all of the above



Fig. 1.



Fig. 2.

Fig. 1.—A single complete cleft of lip and palate operated at twenty-four hours, and the result eight days later.

Fig. 2.—At the top is shown a child that had a poor lip repair in early infancy. Besides the lip notch, notice that the bridge of the nose is drawn to the opposite side. The lower figure shows the inferior view of the same condition in an older child. It also shows the closure of the alveolar process which has occurred even after a poor lip repair.



Fig. 3.—A starved child which later died of inanition. Was breast fed and because the child was able to draw some milk this was thought to be sufficient. A baby sucks both by creating a partial vacuum and by biting the breast at the same time. A cleft palate baby can create no vacuum, but can often draw some milk by compression. When this is so it should be allowed to nurse for the regulation number of minutes each feeding, but this should be supplemented by a feeding from a bottle that has a large hole in the nipple; preferably with mother's milk. The writer has encountered one infant with a single, complete palate cleft, who learned to nurse efficiently by placing the nipple under its tongue and closing the cleft with the dorsum of the same.

mishaps may follow if only the immediate surgical result is regarded, especially when very early closure is attempted.

In either single or double complete cleft of the lip and palate, the cleft will be found to be as wide as the alae of the nose will permit and the premaxilla



Fig. 4.—Shows the closure of the alveolar part of the cleft that will usually occur when the lip is repaired. The upper right picture is of a cast made of a cleft palate in a child twenty weeks old. At this age it is not good practice to forcefully close the alveolar part of the cleft, but the lip was repaired. The other three casts were made at twenty-three, thirty, and forty-four weeks, respectively, and show the gradual closure which occurred from the lip pressure without any damage to the developing teeth.



Fig. 5.—This cast, made from the teeth of a child five years old who had a Brophy operation for a complete single cleft at three months, shows a complete loss of teeth on one side with no destruction of the teeth of the other side. This illustrates that a Brophy may or may not injure the tooth buds, depending, probably, upon just how much they are damaged in putting the wires through the bone. Besides loss of teeth, the arch is contracted anteriorly and laterally, but not too much so for orthodontic correction if sufficient teeth erupt.

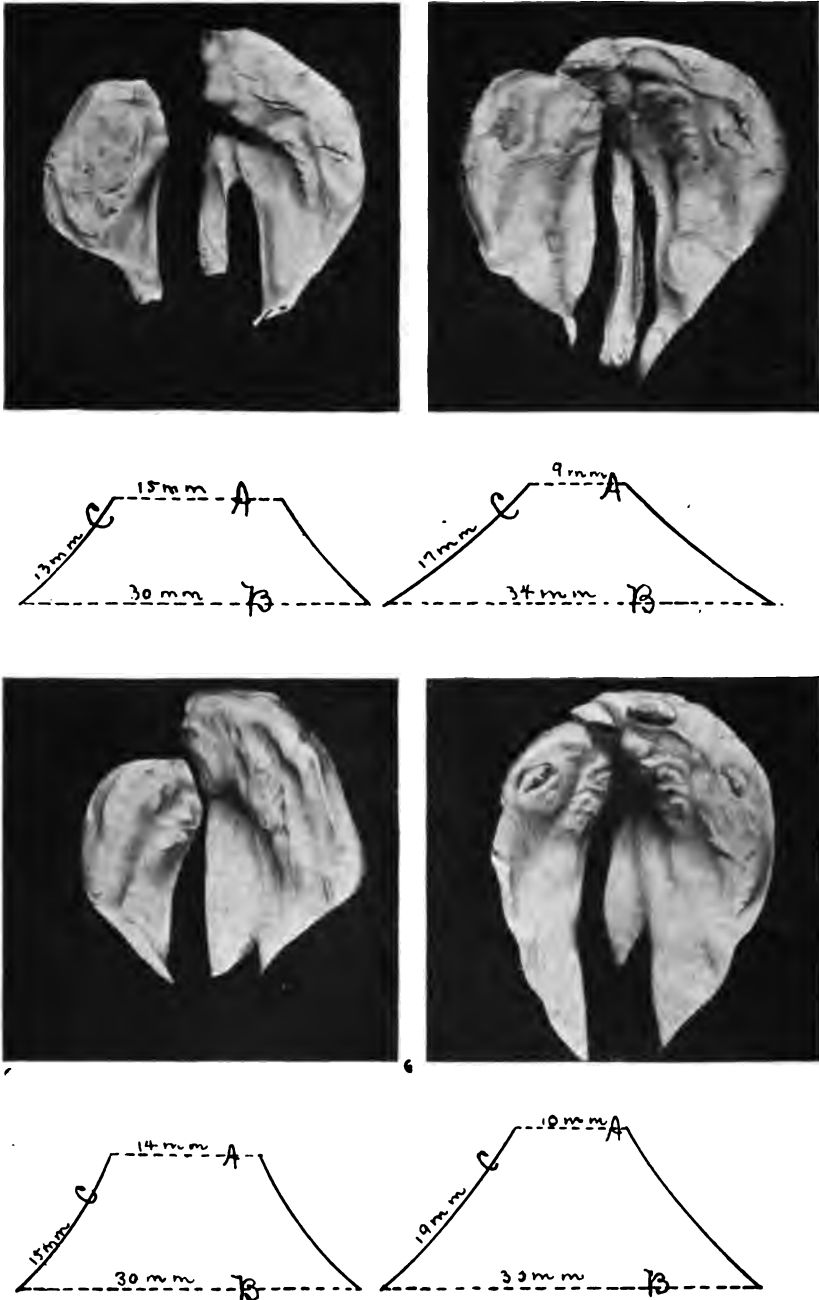


Fig. 6.—The two casts in the top row show a case in which the alveolar approximation was made by a single wire passed through both maxillae and twisted around in front of the premaxilla, while in the case recorded by the two lower casts, a typical Brophy was done which, though it gives a better position to the premaxilla, has little ultimate effect upon the width of the posterior part of the cleft. This will be appreciated by a study of the diagrams below each cast which are supposed to represent coronal sections through the casts at the posterior border of the hard palate. These give, in millimeters: A, the width of the cleft; B, the distance between the alveolar processes (the space that must be filled by flaps in the subsequent von Langenbeck operation), and C, the amount of available palate tissue from which the flaps are obtained. It will be seen that the width of the cleft and of the posterior part of the hard palate has decreased and the available palate tissue has increased about the same amount in each case regardless of the type of operation.

sprung forward, but with comparatively little tissue really missing. The width of the cleft is almost entirely due to an abnormal separation of the maxillæ, but I do believe there is always some of the alveolar process missing, at least if the cleft borders are freshened and the segments adjusted to form a completely rounded arch, it will always be found smaller than normal.

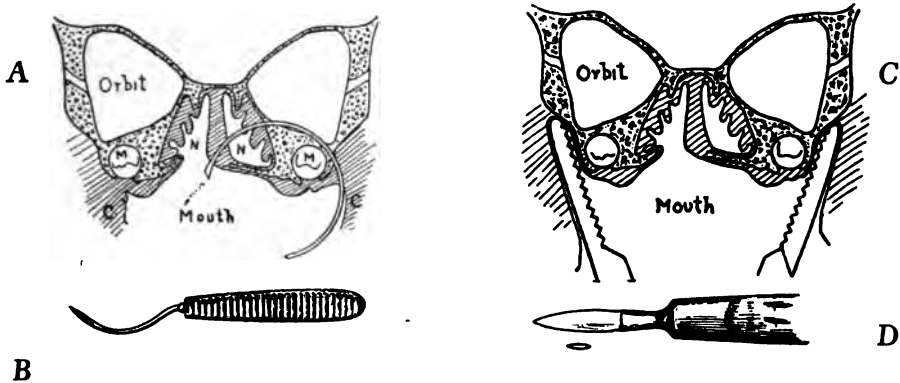


Fig. 7.—A, an accurate diagrammatic reproduction of a section of a head of an infant with a single cleft of the palate. This illustrates how a 5/8-circle needle (B) can be made to pass from the upper buccal fornix through the jaw bone, along the floor of the orbit and into the cleft. C, showing the position of the jaws of the forceps in forceful approximation of the maxillæ. Pressure on the alveolar process, only, may fracture it. D is the double-edged knife we occasionally use in cutting the maxilla. The knife is thrust high into the body of the bone through a small mucous opening and moved forward and backward in the bone. Notice that there is no antrum between the teeth buds and orbit.

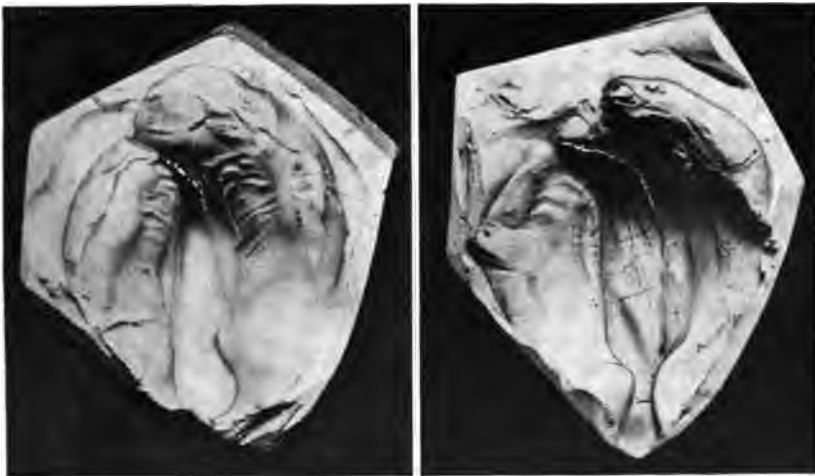


Fig. 8.—Shows on the left a proper and on the right an improper position of the premaxillary bone after the closure of the alveolar cleft. In the latter instance the anterior part of the palate cleft remains wide and difficult to close and is apt to be accompanied by a flat upper lip. (See Fig. 9.)

Early closure of the lip over an open alveolar arch will cause the cleft to contract and eventually close, and gives a very good contour to the arch (Fig. 4).

The Brophy operation allows an earlier satisfactory closure of the lip and of the palate; if the tooth sacs are not invaded and not too much is attempted, I believe it is free from the objections so frequently urged against it. Considerable misapprehension is abroad regarding what is to be expected from this operation



Fig. 9.A.—In the cast in the first case a proper relationship is shown between the premaxillary and the maxillary bones, the latter being drawn close together in front so that the premaxillary rests in front of them. This gave the good lip shown in the photograph to right. Notice how the plane of the upper lip is in front of that of the chin which is correct in a baby. In the case represented by the lower row of pictures the premaxillary bone has been allowed to slip back between the maxillæ which gives a wide anterior part of the palate cleft, very difficult to close, and the very ugly flat upper lip which is on the same plane as the chin. By our best efforts it is not always possible to avoid the latter fault, but it can later be corrected by orthodontic procedure.



Fig. 9.B.—The face to the right shows the facial deformity that may result from placing the intermaxillary bone too far back, while in the one to the left the intermaxillary bone has been removed. The latter procedure can not be too strongly condemned. In the first instance the defect can be corrected by orthodontia, while the appearance of the second case can be greatly improved by prosthesis.

and attempts to forcefully close the whole or the greater part of the cleft are responsible for the cases of distortion or loss of part of the arch or the contracted nasal fossæ that have occurred (Fig. 5). In doing this operation, any efforts are limited to closing the alveolar arch with the best possible relationship between the premaxilla and the maxillæ, and to the narrowing of the anterior part of the maxillary cleft (Fig. 6). Wires that approximate the two halves of



Fig. 10.—Case of boy 19 months old in whom a wide alveolar cleft closed spontaneously without any surgical aid.



Fig. 12.—Shows broad premaxilla easily set in front of the maxillæ and not slipped between them.



Fig. 11.—The first two figures are a photograph and a cast of a case of complete, double cleft; showing the typical forward position of the premaxillary bone and prolabium. If this is left unoperated this position will persist, but an early correction of the position of the premaxilla will be followed by a proper development of the columella and tip of the nose without the aid of any special plastic for this purpose. (See Figs. 14 and 15.) The third picture is of an unoperated case, twelve years old, showing that no spontaneous change has occurred in the relative position of the premaxilla.

the maxilla are passed through the orbit in contact with its floor and not through the tooth sacs (Fig. 7). There is neither necessity nor expediency in even materially narrowing the posterior part of the maxillary cleft at this time, and attempts to do so court immediate and ultimate disaster and are largely responsible for the operation not being universally adopted.

The position given the premaxilla is most important; it should be in front of the maxilla and not pressed into the cleft between the maxilla. The latter



Fig. 13.—Shows good full lip obtained by replacing the premaxilla and repairing the lip.



Fig. 14.—Shows two babies having a recent proper operation for double harelip with protruding premaxilla and prolabium. Notice the snubbed nose and slit-like nostrils which will correct themselves. (See Fig. 15.)

gives a short upper jaw, a flat lip, and renders the subsequent closure of the anterior part of the intermaxillary cleft most difficult. (Compare Fig. 8 with Figs. 4 and 6.) Later the orthodontist is called upon to correct the following condition: a very much retracted anterior part of the arch with a small fistula into the nose, just behind the alveolar process and what the parents have come to regard as relatively unimportant. Unless firm bony union of the alveolus across the former cleft has occurred, in expanding the arch, the cleft is apt to reopen and the small fistula to be converted into a large hole; it will be well to have foretold this.

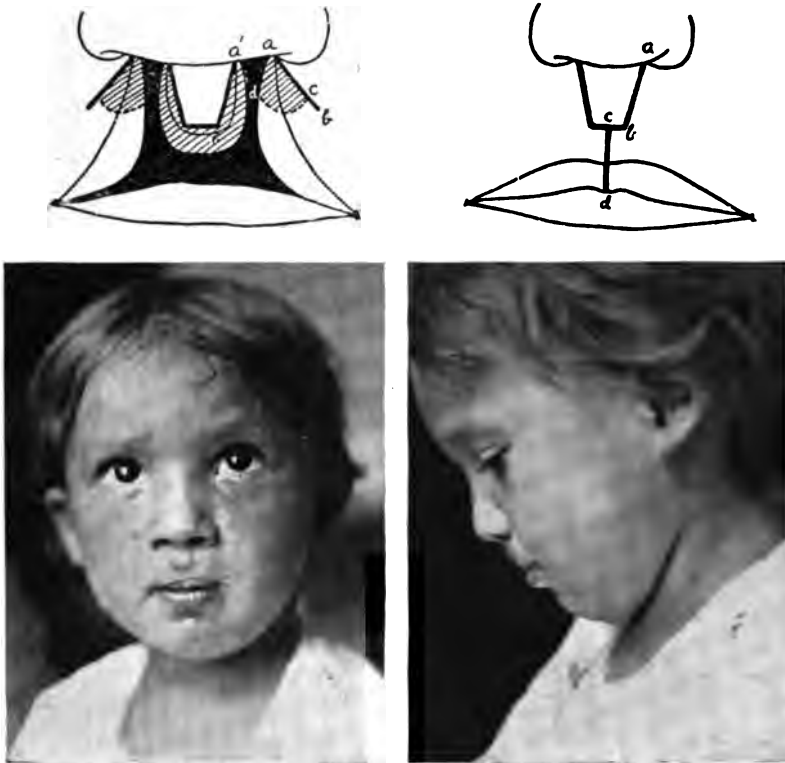


Fig. 15.—Showing a modified Maas operation for double harelip which for want of a better designation we have called the "Washington University Operation." The child shown below had this operation done in early infancy and at first gave the appearance shown in Fig. 14, but notice the beautiful development of the nose that has taken place spontaneously. The defect in the middle of the lip is due to inadvertently leaving a small bit of the vermillion border of the prolabium.

The proper treatment of such a case is to expand the arch to its proper shape and to repair the opening by a flap operation; the reopening of the cleft facilitates the latter.

With a single cleft, I have seen the premaxilla retract and the alveolar cleft close spontaneously, but not so with the complete double cleft where the premaxilla and prolabium will remain forward indefinitely. In the unoperated double cleft, the maxillæ will approximate somewhat so that in replacing the premaxilla it will remain in front of and not all between them (Figs. 10, 11, 12, and 13). Its proper early replacement will be followed by some snubbing of the nose, but this disappears with subsequent growth (Figs. 14 and 15).

The closure of the posterior part of the cleft in the hard and the soft palate can be done after a proper "Brophy" at seven months to a year; after simply closing the lip, it may have to be postponed longer (Fig. 16).

The narrowing of the cleft that follows the "Brophy" or the early lip closure only anticipates what will follow naturally with growth. Though the alveolar

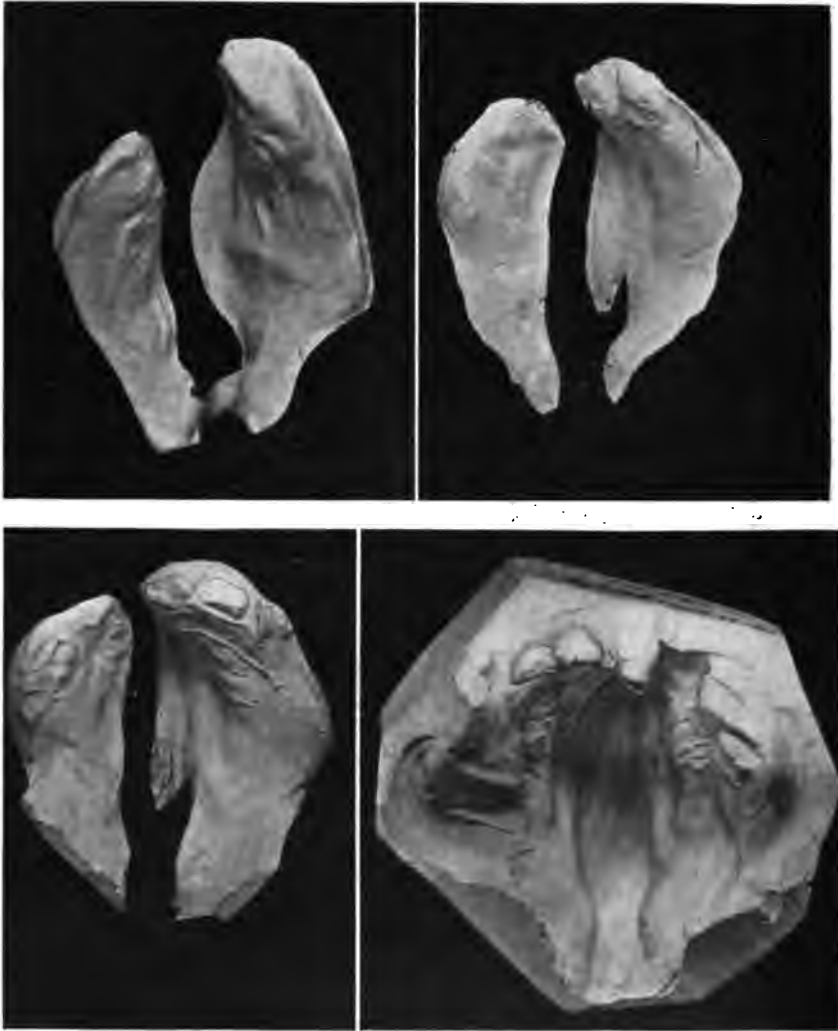


Fig. 16.—The upper two casts and the lower left one are of the palate of the same child taken at the ages of six, ten, and fifteen months, respectively. The lip was repaired over the open alveolar cleft, because at six months the child was too old for a Brophy. The fourth cast is of a child whose lip had been repaired over an open alveolar cleft at two weeks of age, yet, twenty-three months later, it will be seen there was a wide alveolar cleft.

process may remain open, one rarely sees wide maxillary clefts in children twelve years or older. This is why the older surgeons preferred to postpone the operation. The most desirable time to perform a "Brophy" is within the first two days of life, and it is not usually applicable after three months.

Narrowing of the cleft can be hastened at any time by closing the lip, but this

may require a year or more, and lip repair over an open alveolar cleft is not so apt to be satisfactory as over an intact arch. If the upper molars have erupted, the orthodontist can very materially hasten the closure, usually only two to three weeks being required (Figs. 17, 18, and 19).



A.

B.



C.

Fig. 17.—The first cast shows a wide unrepaid cleft at the age of eighteen months. The cleft is partially filled by a transverse part of the nasal septum that would prevent the maxillary bones from being drawn together (see Fig. 7). At the first operation the part of the nasal septum was removed and the palate repaired by a von Langenbeck operation. As a result of the traction of the soft tissues across the bony cleft the palate became narrower, shown in Cast B made three months later, but there was still a wide alveolar separation. Dr. F. J. Brockman constructed the orthodontic appliance shown on Cast B, with which, by means of an elastic band, the alveolar cleft was closed in two weeks, as shown in Cast C. Then the lip repair was made.

Fracture of the alveolus with a chisel should not be done.

The speech training should be undertaken by a competent teacher as soon as the child is old enough to respond—three or five years, but a good teacher can usually help the speech at almost any age.



Fig. 18.—Obliteration of the alveolar cleft by the backward pressure of an expansive arch which here for want of an available tooth pressed against a piece of heavy lead plate, resting directly on the gum. Note that the ala that was tense in the first figure is relaxed in the second.



A.



B.



C.

Fig. 19.—Showing the reforming of the arch by an expansion arch and buckle. Note that the cleft itself has become slightly narrower.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

The Mechanical Reconstruction and Restoration of Oral and Facial Deformities. V. E. Mitchell. *The Dental Outlook*, 1919, vi, No. 10, p. 295.

Although the author has not been in service at the front his experience in private practice and in hospital clinics has given him a great deal of material for the study and working out of many problems. The principles involved in the treatment of these conditions are the same as in war injuries. The wonderful advancement in the treatment of jaw and facial injuries at the front is essentially due to the fact that the Government has become wise enough to add sufficient dental and oral surgeons to the army, with their special knowledge of handling these conditions.

When a portion of the jaw has been lost, either through necrosis or by surgical removal, the remaining fragments or parts are drawn toward each other by the contraction of the muscles, and the teeth are thrown out of occlusion, thus producing in many cases a great deformity. To prevent this it is necessary to keep the remaining portions of the jaw immobile and in proper alignment by a fixation of the teeth in their natural occlusion before the injury. The simplest method is to ligate the teeth of both jaws together with bronze wires. Angle's gold or German-silver fracture bands cemented to the teeth with loops or lugs upon the buccal surfaces, which are drawn together with wire ligatures, are also very satisfactory in some cases. The vast variety of conditions presented calls for a great deal of ingenuity and skill in devising appliances for this purpose, but the modern orthodontia appliances furnish a good beginning. Where it is possible to hold the fragments in place without ligating both jaws together, it is preferable for hygienic reasons as well as for the comfort of the patient. At the present time, the approved method of restoring the lost portion of the mandible is by means of bone-grafting, utilizing either a portion of the tibia or of a rib. By the dentist's cooperation with the surgeon, much can be accomplished in oral and facial deformities.

The most difficult oral defect to remedy is congenital cleft palate, and from his experience in this field, the author has come to the conclusion that much suffering is caused by the old antagonistic feeling between surgeon and dentist. A prosthetic restoration of deficient tissue will undoubtedly give better results than

surgical operations, in the many cases with a lack of tissue, which means that when operated upon, a shortening of the uvula and a stretching of the soft palate result, which does not improve the speech. Appliances of many shapes and different materials have been devised for the closure of the cleft, but with apparently little regard to the restoration of the nasal passages so as to permit normal respiration, or to the restoration of the resonance chambers, for the improvement of the voice and speech. All of these things have been taken into consideration in the appliances devised by the author, and an attempt has been made to restore all of the missing tissues and their functions. However, speech is not restored immediately, although the lost parts are restored to a nearly normal condition, and the accomplishment of satisfactory results with regard to speech will require sensible and persistent cooperation between dentist and patient.

Gingivitis as a Cause of Pyorrhea. S. Danson. *The Dental Outlook*, 1919 vi, No. 10, p. 293.

Gingivitis is the immediate predisposing cause of pyorrhea, and any injury of the gums may turn out to be more fatal than caries of the teeth, in view of the fact that gingivitis may pass into a chronic state without noticeable discomfort or warning of any kind. The gums and periodontal tissues require no less serious consideration on the part of the dentist than do the harder structures in the form of the teeth themselves. A distinct type of gingivitis is caused by the deposit of serumal calculus in the subgingival space, meaning a deposit under the free margin of the gum, or upon the pericementum after the periodontal membrane is detached. The underlying causes for the deposition of serumal calculus are identical with those of salivary deposits. The first effect of serumal calculus in the subgingival space is to cause an irritation of the gingiva, the greatest danger of which is inflammation, and the subsequent detachment of the periodontal membrane. Suppuration usually follows, beginning at the gingival margin and then spreading to the periodontal membrane; the gingiva subsequently shrinks away and pockets are formed alongside of the root of the tooth. Thus pyorrhea becomes definitely established. Other causes of gingivitis are represented by malocclusion and traumatic occlusion of the teeth. The gums may also become inflamed by contact with the sharp edges of cavities and the imperfect margins of fillings. Similar irritations are caused by crowns which do not closely fit the root, or which infringe upon the attachment of the periodontal membrane at the gingival line. Lack of cleanliness of the mouth; errors in cleansing operations, and the misuse of tooth-picks, tooth brushes, rubber bands and silk floss, often lead to gingivitis. It is the dentist's duty to care as much for the preservation of the gingival tissues as for that of the harder tooth structures.

The Value of Benzoic and Salicylic Acids. G. J. Bleacher. *The Dental Digest*, 1919, xxv, No. 9, p. 535.

These two medicaments have been employed for the last few years by the author and have proved very beneficial in his hands in the treatment of infectious conditions about the oral cavity, and the treatment of pyorrhea, and also in the treatment of septic conditions of root canals, as well as a destroyer of bacterial life in cavities previous to filling teeth. The reason these two medicaments are

of value, is because they produce quick results, inasmuch as they require so short a time to produce devitalization of bacteria. Besides being powerful and quick in action, salicylic and benzoic acids have the advantage of not being escharotic. If employed as a mouth wash in a 1:100 dilution, either acid has no equal for the destruction of the pus-producing bacteria, if the rapidity of its action is taken into consideration. Benzoic and salicylic acids are very valuable for injection around pus-pockets in pyorrhea, by dissolving either in camphorated oil to the extent of one per cent and also employed in the same solvent, or in any essential oil, in the treatment of canals. It may also be combined with two per cent formalin or trikresol, and may also be added to alcohol in swabbing out canals or in cavities previous to filling. As a mouth wash, the author usually combines benzoic acid with thymol, to which he also adds menthol, some of the essential oils and glycerine.

Advantages and Disadvantages of Reduced Silver in Dental Therapeutics.

U. G. Rickert. *The Journal of National Dental Association*, 1919, vi, No. 10, p. 930.

Summary: The possible advantages of reduced silver would suggest its use for prevention of caries, the protection of nearly exposed pulps, the possibility of filling certain tortuous canals, and preparation and treatment in root resection. As to the disadvantages, the instability of the solutions, the discolorations attending its use, and possible irritations are the most important. While these disadvantages are subject to control, they offer no encouragement in root-canal work to operators desiring a method infallible in careless operations. The fact that silver solutions properly reduced will sterilize, should not be depended upon to admit of less care than that required by other methods. Operators are cautioned not to be overconfident in the sterilizing properties of silver, and take too long chances. There is already evidence that this has too often been the case, and serious results are certain to follow.

The author's conclusions regarding the several silver treatments are based first, on some well established therapeutic and bacteriologic principles; second, on clinical observation; third and last, laboratory experiment. The silver solution used for rapid reduction is made up as follows: Silver oxide is precipitated from a silver nitrate solution with potassium or sodium hydroxide. This is carefully washed to remove all impurities and kept moist in a small amber colored bottle. In this condition reduction is so slight that the author was enabled to keep it for a long time without much change. If a small amount is insoluble in excess of ammonia, there has been too much reduction and the silver oxide should be freshly prepared. This is the writer's stock solution and is more desirable than the ammoniacal solution made from silver nitrate, because it is free from nitric acid and other impurities.

The Temple of the Tooth. *Wide World Magazine*, Oct. 1st, 1919, p. 84.

This periodical brings an interesting illustration depicting the Temple of the Tooth, a gaily colored palace situated in Kandy, Ceylon, where a sacred tooth supposed to have belonged to Buddha is kept. An octagonal building near the temple is called the Pattripuwa. Both buildings are surrounded by a moat in

which are many turtles. Inside the temple Buddhist priests make an ear-splitting noise with tom-toms and other native music. Once a year a procession called the perahara leaves the temple with the sacred tooth said to be the tooth of Buddha, which is carried around the town on the back of a large elephant. A number of Kandyan chiefs in their splendid and quaint costumes, accompanied by more than one hundred elephants and much native music and dancing, take part in the picturesque procession.

Epithelial Debris Located in the Peridental Membrane and Other Structures. E. S. Talbot. *The Dental Cosmos*, 1919, lxi, No. 10, p. 929.

The true nature of certain epithelial cells found in any part of the alveolar process in the embryonal tissue, outside of the follicular wall, before the bone begins to form, was first demonstrated by the author twenty years ago, on the basis of an extensive line of research upon sheep, and he was the first to give these bodies the name "epithelial débris." Occurring in the peridental membrane throughout the entire length of the root, these epithelial débris are usually more numerous at the cervical margin, but occasionally are found in greater number of cells at the apical end of the root, especially in sheep. With special reference to the origin of these bodies, they are developed from the enamel organ, the epithelial cells migrating in all directions into the sac wall, part of which finally becomes the peridental membrane. These cells are also caught in the development of the cementum, as shown in the author's recent research work upon humans, dogs, sheep, and monkeys, with material obtained at or soon after birth. The epithelial débris described by him are derived from the external epithelium inclosed within the follicular wall. The live cells of the external epithelial layer migrate into the inner fibrous tissue of the sac but do not pass through into the alveolar process. The fibres of the alveolar process now unite with those of the outer surface of the sac, which later becomes filled with calcium salts to form the alveolar process. The latter now encroaches upon the sac wall, which becomes the peridental membrane, holding the epithelial débris within its fibres.

This important serial contribution to the histo-pathology of the jaws and apical dental tissues is further enriched by a number of illustrations, under low and high magnifying power, which are essential to the understanding of the author's line of argument and should be consulted in the original article.

Supplementing Radiography with Blood-Tests. *The Compendium. Oral Health*, 1919, ix, No. 9, p. 342.

Although radiography has done much to improve dentistry, it has its limitations, and too hopeful a view may be taken in regard to the outcome of dental treatment in difficult or obscure cases, when the prognosis is based entirely upon the radiographic findings. In the interest of the patient as well as the dentist himself, it is necessary to look for more information than can possibly be given by dental radiographs. A blood-test, together with a full radiographic dental series including the sinuses, seems to be imperative if a dentist is to undertake the successful treatment of the various ailments which come under his care. As a matter of fact, it becomes his duty to find out if such an examination has al-

ready been made by the physician, and the need for cooperation between the two professions thus finds another illustration. It is indeed futile for any dentist to promise a cure for systemic ailments, unless he has found out the nature of the infection and assured himself that the treatment comes within the range of dentistry. The radiographic disclosures are limited to the showing of rarefied areas of bone, canals improperly filled, pyorrhea pockets, large areas of necrosis, cystic formations, and so forth. In the presence of obscure systemic conditions, for which many a patient is now referred to the dentist, it is hardly reasonable to expect the whole situation to be immediately clarified by dental x-ray examination alone.

An Effort to Discredit the Fifty Cent Radiograph. H. R. Raper. *Oral Hygiene*, 1919, ix, No. 10, p. 1230.

In this most timely and opportune article, the author graphically describes the evils of cheap radiodontic work. He feels that he can do the greatest amount of good to the public, to the profession of dentistry and the new specialty of Radiodontia if he can put the fifty cent radiograph where it belongs and make it stay there with the two dollar and fifty cent crown, the five dollar set of teeth, the thirty cent amalgam filling and the bottle of patent medicine. The cheap dental x-ray photographer can make ten or more negatives, while the conscientious radiodontist is making a diagnosis of a single intra-oral x-ray negative area. The service of the radiodontist is to (1) obtain necessary data; (2) make faradic electric tests and such other tests as may be indicated; (3) make radiographs and make them over as many times as expediency may demand; (4) give a report to dentist or physician or both and give such advice, suggestions, prognosis, consultation and assistance as may help the patient, or those who are treating the patient. But the service of the dental x-ray photographer is simply to produce negatives in large numbers, and blame the x-rays i.e., the radiographs, when they fail to show what would have been shown if the radiographs had been made at the right angle to get a good diagnostic negative instead of at the lazy man's sure-shot angle. (The author here refers to the high-above angle for the upper teeth and the diagonal angle for the lowers; about 65° from the horizontal for the upper teeth; 40° for the lower). The fifty cent radiograph is, in brief, a money-making scheme. A fair price for a radiograph affords the opportunity to give good service, while the fee of fifty cents destroys such an opportunity. The necessity for quantity production of cheap radiographs is indicated by the fact that the cheapest laboratories flourish in the largest cities. Good radiodontic work is threatened with extermination by the low fee process.

Exodontia in General Practice. A. Wald. *The Dental Digest*, 1919, xxv, No. 9, p. 517.

Strict surgical asepsis should be the key-note to every oral operation. Tooth extraction is important and serious. The most prevalent complications after extraction are after-pains and hemorrhage. Pain after extraction is due to several causes, some avoidable, others unavoidable to some extent. A frequent cause of after-pain is a sequestrum or bit of fractured process left in the socket. This can

be avoided by proper inspection of the wound after extraction. If, however, it has been overlooked and the wound partly healed the parts should be opened and the sequestrum removed. The wound is then thoroughly irrigated with warm normal salt solution and patient discharged and instructed to return for inspection. In all painful conditions of the sockets, orthoform powder or iodoform gauze will relieve the pain in most instances. Undue spreading of the alveolus is a frequent cause of pain and can be avoided by compressing and reducing the distention immediately after extracting. If, however, this has been neglected at the time of operation, it will be a rather painful procedure, preferably to be done under an anesthetic. Foreign bodies such as particles of filling material are sometimes the cause of pain. They are often difficult to locate and require the aid of x-ray, for they may be lodged deep in the socket and escape discovery by eye or probe. Fractured bits of enamel of the extracted tooth or fragments of the root may also be the cause of disturbance. An acute undischarged alveolar abscess will cause pain, but the symptoms are entirely different from the usual socket disturbances and can be readily diagnosed. When any suspicion of pus exists, without proper drainage having been obtained at the operation, the wound should be lightly packed with iodoform gauze and kept under observation until all danger has passed.

Home treatment after extraction is important. The patient should be warned not to touch the wound with his fingers or any other object. A mouth wash is prescribed and the patient instructed to use it frequently. Every case should be inspected after 24 hours; if at that time the conditions of the wound are not satisfactory, proper treatment should be immediately begun.

Cancer of the Mouth. F. Bryant. *Boston Medical and Surgical Journal*, 1919. clxxxi, No. 15, p. 452.

The family dentist should be constantly on the lookout for mouth conditions which may be acting as a present or future cause for general disease. In relative frequency, as a favorable haunt of malignant disease, the mouth ranks fourth, being surpassed by the female breast, uterus, and the gastrointestinal tract. In man, the mouth is six times more susceptible. Although the exact cause of cancer is not known, chronic irritation in some form is held responsible for an important share in its etiology, a theory which is well borne out by mouth malignancy for besides harboring a multitude of germs, the human mouth abounds in exceptional sources of chronic irritation. Neglect of the teeth gives scope to irritative influences which in turn may lead to oral cancer, imposing upon the family dentist the duty to protect his patient against chronic irritative influences. "Viewed in this light, the dentist becomes the master-man in the great struggle to combat oral malignancy." Physicians and dentists should combine their knowledge and experience in the good cause of early removal of chronic irritative influences and the early detection of precancerous symptoms in the mouth.

The method of treatment which in the author's opinion gives the best results and the best promise for the future, is a combination of the cautery or electro-coagulation, radium, the roentgen ray, and surgery. The most dependable of this group, in his experience, the one he always uses in every case, and frequently alone, with great satisfaction, is the massively tremendous dosage of roentgen

rays. In combined radium and roentgen ray treatment, he makes use externally of the most massive roentgen ray cross-fire dosage that can possibly be produced, sparing neither tube nor machine in delivering the deepest penetration possible, without a single outward result after three years' experience. This use of radiation is now regarded by him, on the basis of extensive practical experience, as one of decided potentiality.

The Maxillo-facial Surgeon in a Mobile Hospital. Rea P. McGee. *Journal American Medical Association*, 1919, lxxiii, No. 15, p. 1114.

Only a few points of this comprehensive contribution can be selected for consideration in the limited scope of an abstract. The author was detailed as maxillo-facial surgeon to U. S. Mobile Hospital, No. 1, A. E. F., which was always in the area between the 75's and the six inch guns, and which received only the most desperately wounded men. Bone injuries in the maxillary region were most severe when caused by high explosive. Union in fractures of the maxilla usually occurs much more promptly than union of the mandible; but when a prompt result is not obtained, it is much more difficult to treat an ununited fracture of the maxilla. Abscessed teeth or teeth that were actually loosened in the line of fracture were always removed. Every fractured jaw must be drained at the point of the fracture. Drainage must be carried to the extreme. The great points to be observed in the front line work are the conservation of bone, mucous membrane and skin. All bone fragments that have live periosteum must be retained. Fractures of the jaw in war surgery are almost always complicated by wounds of the face. The jaw should first be splinted, or at least, temporary splint wire should be placed and followed by repair of the facial wound. All live tissues and all bruised tissues that have a sufficient vitality to recover must be preserved, and the rich blood supply of the face makes it possible for many bruised areas to regain their circulation. Actual loss of tissue sufficient to require flap transfer is comparatively rare. Wounds of the tongue were numerous. Bone fragments, teeth and bullets were commonly driven into and sometimes through the tongue. These injuries are not difficult to repair with proper instruments, and in no case was there failure of union. In this connection, the author's statement is interesting and suggestive that although the equipment furnished by the government for the first line work in this department of maxillo-facial surgery was well planned, the insurmountable difficulties in procuring specially designed instruments at the beginning of the war defeated the fulfillment of the plans. The only possible remedy was adopted by the author when he took his own equipment, a plan recommended by him as the only satisfactory solution for all specialists in any war or in any army.

Benefits Derived from Combined Meetings of Physicians and Dentists. J. K. Eyler, *Pennsylvania Medical Journal*, 1919, xxiii, No. 1, p. 24.

In the interest of public health, a closer association and advisory relationship of physicians and dentists is advocated by the author, who appreciates the benefit dentists would derive from the papers on various subjects read at the meetings. No doubt the affiliation would be a stimulus to both the medical and dental as-

sociations for higher efficiency and result in greater good to the public in general. The recognition of the mouth as a focus of infection has brought about the awakening of the medical profession to the relation of the condition of the teeth to health. The medical and dental professions can not be too closely related to each other in the diagnosing of disease and the treatment thereof, and with the advantage of the roentgen ray machine and the latest dental technic, it is up to the two professions to cooperate more closely in the treatment of disease, and urge, what every man or woman should know, and children be taught that "good health and good teeth are dependent one on the other." It has long been pointed out by the seers of dentistry that, since many systemic affections may have definite origin within the oral cavity, in the future the foundation of a true dental profession must rest on the same foundation as medicine, and not so much on handicraft and mechanics.

Relation of Teeth, Tonsils, and Intestinal Toxemias to Diseases of the Eye.

G. H. Bell. *Journal American Medical Association*, 1919, lxxviii, No. 15, p. 1127.

The importance of focal infections encountered in the practice of ophthalmology, more particularly the teeth, tonsils, and toxemia of the intestinal tract, is emphasized by the author on the basis of extensive personal experience in the Eye Department of the New York Eye and Ear Infirmary. With special reference to dental infections as a cause of eye disease, too much stress can not be laid on a thorough examination of the teeth, which includes: (1) An inspection of the mouth; (2) palpation of the gums; and (3) roentgenograms of all the teeth, dead or alive, pivots, arches, and bridges. Any part of the eye may be attacked as a result of dental infections, but by far the greatest number of cases show the iris, ciliary body, choroid or cornea to be affected. In operations on the eyeball, when pyorrhea alveolaris is present, or when he suspects any trouble with the teeth, the author always begins by referring the patients to an up-to-date dentist, who at once starts his treatment. When the dentist has finished with the patient, from four to six weeks are generally allowed to pass before operating, with the object of eliminating all toxins from the system. It is an admitted fact that toxemia may result from chemical changes in the intestinal contents, that absorption of protein toxins from the intestinal tract takes place, and that the blood stream is the carrier of the infection, the three common foci being the teeth, tonsils and the intestinal tract. Modern dentistry is relieving the world of much misery, by the watchful care of the foci connected with the teeth, and the time is not far distant when modern dentistry will be made a department of medicine. While many of the results of oral infection are apparent to the eye, the deep-seated and hidden foci, which are frequently the most virulent, are entirely hidden and can only be revealed by the roentgenogram. Decayed teeth afford a ready passage into the system for disease germs, and patients must be educated to look after their teeth and tonsils as well as their diet.

The Importance of Oral Hygiene. F. Gonzalez. *Revista Dental, Habana*, 1919, xii, No. 9, p. 265.

The importance of oral hygiene may be considered from three viewpoints, the esthetic, the physiologic, and the infectious. Neglect in this respect inevitably leads to dental caries and loss of the teeth. Alveolar absorption involves the obliteration of the facial outlines and alters the expression of the countenance. The mouth is the entrance-point of the majority of the pathogenic and non pathogenic germs which infect the body and find in the mouth all conditions necessary for their survival, in the form of heat and moisture, nourishment, and a suitable reaction. The capacities of the mouth as an excellent breeding-place for these germs are greatly increased by deficient oral hygiene. The most harmful bacteria are represented such as the typhoid and tubercle bacillus, perhaps even the *Neisser gonococcus*, which is claimed to be identical with the diplococcus found in pyorrhea. These bacteria merely wait for the organism to become debilitated to exert their virulent activities, and this weakening may be due to the same deficient hygiene, for we know that certain septic dyspepsias originate in the buccal cavity and that many cases have been cured simply by the removal of an infected prosthetic apparatus. The circulatory and renal systems, the liver, the intestines, etc., are often weakened or slightly diseased, but recover spontaneously under favorable conditions; on the other hand, when the mouth is not in a hygienic state, the organism is weakened, with the result that these affections are aggravated and may become chronic. This constitutes an important factor of oral hygiene as related to the health of the individual, for the remote cause in these cases is undoubtedly the lack of this hygienic care. The Mayo-brothers have shown that some cases of peritonitis are referable to the lack of oral hygiene, and they operate upon no case of appendicitis without first securing thoroughly hygienic conditions in the patient's mouth. In addition, the neglect of oral hygiene is followed by dental caries, gingivitis, and stomatitis, as a result, the food is imperfectly prepared in the mouth and more work is thrown upon the stomach, while the inflammatory products and epithelial remnants which are swallowed, act as a poison for the general system.

The science of dentistry has made rapid progress, and the dentist has come to occupy the position in medicine to which he is entitled as shown by the establishment of a Municipal Dental Service in all large cities of the civilized world, and by compulsory inspection of the teeth in the dental services of the schools in the United States. One of the requirements for entrance into the American Army is a satisfactory state of buccal hygiene. The author believes that in the course of years, by further progress along these lines, the race will be greatly improved and many of the affections which are now treated empirically will disappear, their etiologic origin having been traced to the mouth.

Mandibular Bone Grafts. C. W. Waldron and E. F. Risdon. Royal Society of Medicine. Section on Surgery, 1919. Meeting of Jan. 22nd. *Lancet*, London, 1919, p. 181.

The authors state that although bone transplantation is a surgical procedure of long standing, the unexampled opportunity afforded by war injuries has permitted a careful study of its limits and possibilities, especially in cases in which the mandible has been seriously broken up. They consider that the close and continuous cooperation of surgeon and dental surgeon is of prime importance in these cases. In early stages the mouth must be kept as clean as possible, special care being taken in regard to septic pockets and cavities, and in this stage dental splints should be used, the hindering sequestra being from time to time removed, for the prevention of displacement and to ensure due control of the edentulous posterior fragments. Dental splints are usually required for at least two months. In cases where nonunion is obvious, there should be early attempts at movements of the jaw for the purpose of avoiding atrophy and articular ankylosis. Careful periodic examination of the teeth and the extraction of such as need it is regarded as important. Teeth which are of service in the immobilization of the parts should be preserved, and there should not be any great pressure on the teeth. Drainage must persist so long as there are any unhealed sinuses. At least six months should elapse after the disappearance of sepsis and inflammation, before bone grafting operations are attempted; and when the ununited fragments are strong and easily controlled, so that the patient is able to masticate with the aid of splints, this period before operation can be extended. The authors believe that quite a number of failures have been attributable to operation having been done too early. Grafts should include both the periosteal and the endosteal surfaces; in fact, all the elements should be comprised, the graft will then most nearly approach the physiologic. When open cancellous bone, such as that of the rib, is used, replacement is rapid; it is less rapid in grafts cut from face or tibia. The relative osteogenetic activity of transplanted bone varies with the individual case. The author's work has been done with autogenous bone grafts. In most instances it is preferable to fix the fragments in good position by means of strong dental splints and carry out the operative procedure accordingly. The splints should be cemented to the teeth at least a week before the operation, to allow the buccal mucous membrane to become habituated to their presence. Every effort must be made to avoid perforation into the mouth cavity. The edge of the fragments should be trimmed back 2 cm. and intervening cicatricial tissue excised and discarded. After a good deal of experience the authors believe bone from the iliac crest gives the best results. The patient should be kept in bed a few days to prevent the formation of a hematoma, which might become infected. If a case requires closure of the mouth for months, it should be opened at intervals for inspection.

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EDITORIALS

Malocclusion and Pyorrhea

WE have often called attention to the fact that malocclusion is one of the most potent causes of pyorrhea that exists today. However, in making that statement we have always been accused of advocating the dangers of malocclusion and consequently trying to impress upon the public the seriousness of what might happen if malocclusion was not corrected, in order that we might further our own specialty. However, a paper by Dr. C. P. Wood of Detroit, Mich.,* who is not an orthodontist, contains a number of statements with which we so thoroughly agree and with which we believe many members of the dental profession are not exactly familiar that we can not allow it to pass without emphasizing the importance of the subject.

*Wood, C. P.: A Consideration of Induced Malocclusion as a Factor of Pyorrhea Alveolaris, Dental Items of Interest, xlii, No. 9.

Almost any one who has practiced orthodontia for a number of years has probably been asked the question many times, as to what would be the ultimate result if the malocclusion was not treated. A great number of orthodontic patients seek our service, because the malocclusion is producing a facial deformity and they realize the treatment of the condition will improve the facial beauty. Nevertheless there remains a large number of untreated and troublesome malocclusions, which disturb the facial beauty very little, but which are the most serious conditions we are confronted with from a pathologic standpoint. We have long realized the seriousness of this type of malocclusion, and have often refrained from stating the seriousness of the condition because a great many people would be inclined to believe that we were painting the picture too black in order to influence them to have the malocclusion corrected. It is, therefore, with a great deal of satisfaction that we find statements made by a man in another specialty which confirm the opinion and knowledge which we have gained from the practice of orthodontia and which shows that "Malocclusion is responsible for more serious troubles with the masticating apparatus than all other causes put together; not the least of these is pyorrhea. Malocclusion is a great factor in the causation of pyorrhea." If we as orthodontists make these statements to our patients, they are inclined to believe that we are telling them too much, because, unfortunately, the average individual or parent is unable to carry a picture of dental conditions as they will be ten or fifteen years hence and realize the serious consequences that will develop. We have long contended that malocclusions were simply the result of forces of occlusion which have gone wrong, and we are pleased to note that Dr. Wood in his article lays particular stress upon two forces of occlusion as being factors in the production of malocclusion and pyorrhea. He calls attention to the abnormal action of the inclined planes of the incisors and canines, which result when the contact is broken by the extraction of molars and premolars. The destruction of the forces of occlusion by the extraction of a tooth which first destroys the proximal contact very soon results in the drifting of the remaining teeth, which eventually brings into play the abnormal forces of the inclined plane. This, of course, produces a traumatic occlusion, which periodontists recognized again as a cause of pyorrhea. However, it necessarily follows that traumatic occlusion is the result of some abnormal force of occlusion, whether it be produced from extraction or the improper correction of malocclusion as has been called to the attention of the profession.

We are aware of the fact that a great many malocclusions in children are going untreated, because the dentist fails to realize the condition that is going to develop as the result of that malocclusion fifteen or twenty years later. In a great many instances parents object to orthodontic treatment and the financial outlay, because they fail to realize the benefit the child will derive from it. The correction of the malocclusion from an esthetic standpoint is the smallest thing that we give our patients. A case of malocclusion when properly treated gives the individual a dental apparatus with which he is going to escape a large number of troublesome conditions later in life, which conditions are absolutely certain to develop, as stated by Dr. Wood, unless the malocclusion is corrected.

It is interesting to note that Dr. Wood has recognized the fact that the treatment of malocclusion is one great factor in the prevention of pyorrhea later in

life. He even consents to give the orthodontists credit for doing a certain amount of good for the patient, whereas, we have repeatedly seen papers by periodontists who have condemned orthodontic treatment, claiming the orthodontists were doing more harm than good. We will admit that the criticism holds true of some methods of treatment, but it does not prove that the science of orthodontia does not do a great amount of good if properly practiced and scientifically conducted. In regard to the question of malocclusion treated with improper appliances producing pathologic conditions, we must unfortunately admit that it is true, but we also desire that men do not lose sight of the fact that a great amount of good can be done by proper methods of treatment.

Another feature which Dr. Wood mentioned in his paper, is the harm produced by the promiscuous extraction of third molars, thereby allowing a second molar to drift distally and destroy the proximal contact between the second and first molars. There is probably no tooth in the mouth about which so many positive (?) statements have been made as have been in regard to third molars. We find men who seem to have an insane desire to extract every third molar they see regardless of its condition, and justify themselves by saying the third molar was not needed anyway. In a great many mouths the third molar becomes a useful tooth as explained by Dr. Wood, in completing the proximal contact of the arch and acting as a buttress for the second molar. We also know other cases where the third molar becomes a contributing factor to the production of malocclusion, and if allowed to remain in that sense may be said to be a contributing factor to pyorrhea as malocclusion is one of the greatest factors in the causation of pyorrhea. Consequently, we find as in a great many cases that no one rule can be applied to all individuals, and in one patient we would advise and insist upon the keeping of the third molar and in another patient we would recommend its extraction. This simply shows that men engaged in the practice of orthodontia or periodontia must have a much broader knowledge of anatomic and pathologic conditions than has been possessed by certain individuals in the past. We are opposed to radical statements along any line, for example, the individual who says, "all third molars should be extracted," or the equally mistaken judgment that "they should all be retained," for those questions can only be answered by knowledge of the forces of occlusion as we know them to exist today.

We wish to agree with Dr. Wood and compliment him upon his masterful presentation of the subject, and again make the statement we made before that there is a close relation existing between malocclusion and pyorrhea.

ORTHODONTIC NEWS AND NOTES

The editors desire to make this department a permanent feature of the Journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

Alumni Society of Dewey School of Orthodontia

The next annual meeting of this society will be held on April 1, 2, and 3, 1920, at the Edgewater Beach Hotel in Chicago. The usual high standard of the meetings of this Society will be maintained. One-half day will be devoted to clinics. All interested in orthodontia are cordially invited to attend these meetings. Address all communications to the Secretary, Dr. George F. Burke, at 741-43 David Whitney Building, Detroit, Michigan.

Pacific Coast Society of Orthodontists

The Pacific Coast Society will hold its next annual meeting on the 17th, 18th, and 19th of February, 1920, at the Palace Hotel, San Francisco, California. Doctor J. Mershon, of Philadelphia, will give a course in technic. Dr. John R. McCoy, of Los Angeles, is President of the Society. Address all communications to Dr. Carl O. Engstrom, 306 Hagelstein Building, Sacramento, California, who is secretary and treasurer of the society.

Notes of Interest

Dr. P. T. Meaney announces the opening of his offices at 301 and 302 Stevens Building, Portland, Oregon, for the exclusive practice of orthodontia.

Dr. Paul J. McKenna is now located at 69 Chestnut St., Springfield, Mass., where he will succeed Dr. A. LeRoy Johnson in the practice of orthodontia.

Dr. Lowrie James Porter announces the removal of his office from Grand Rapids, Michigan, to the Professional Building, 17 East 38th St., New York City, for the practice of orthodontia.

Dr. Harry L. Hosmer has returned from France and has opened his office in the Shurley Building, 32 Adams Avenue, West, Detroit, Michigan, for the exclusive practice of orthodontia.

Dr. Norris Clayton Leonard announces the removal of his office from Nashville, Tennessee, to 1113 N. Charles St., Baltimore, Maryland, for the exclusive practice of orthodontia.

Dr. Oscar M. Schloss announces the removal of his office to 39 East 61st Street, New York City. Dr. Schloss was formerly located at 140 West 58th Street.

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ORIGINAL ARTICLES

A SYSTEM OF KEEPING ORTHODONTIA RECORDS*

BY C. W. B. WHEELER, D.D.S., NEW YORK CITY

FOR a number of years I have been extremely interested in the matter of orthodontic records, and the problem of getting these records with as little inconvenience and loss of time to the operator as possible.

This will necessarily be a short paper, as it deals with the description of a system of keeping records, which in itself, should be as compact and easily handled as possible to make it efficient, and for this reason, needs very little explanation.

Dr. Lischer's excellent paper which was read before this society at Pittsburgh in 1916, I believe was an inspiration to all of us, and he pointed out why records should be kept both for our benefit and that of others. He went over the reasons why every one should feel himself deeply obligated to keep such records, but this paper deals only with my methods, which may or may not be already used by some of you, in whole or part.

I trust it will bring out a discussion that will still further simplify the matter, because I believe, it is the thought of the immense amount of work involved that keeps many from having a most valuable record file.

1. DESCRIPTION OF CARDS AND ENVELOPES

I will first describe envelopes, records, and time index cards, then my methods of using them for notes, records, and as an appointment file.

Envelopes.—The envelopes that we use are four by six inches, so that any file this size will accommodate them, and an opening is cut in the upper left hand corner that allows the name of the patient and the case number on the card or cards enclosed, to show through. The space above the opening is left for the

*Read before the Nineteenth Annual Meeting of the American Society of Orthodontists, St. Louis, Mo., March 10, 11, 12, 1919.

To use these cards and envelopes as I do, it is also necessary to have a small box or file conveniently placed on either the cabinet by the side of a chair, or

[illegible]

Fig. 2.

near there, that will hold about twenty of the envelopes. Also a regular file alphabetically arranged in another part of the office convenient for your secretary to get at.

METHODS OF KEEPING RECORDS

When a new patient starts work he is given a case number, and this with his name is placed on Cards A and B, the case number being also placed on the envelope.

The envelope with cards enclosed is then placed in the regular file under the first letter of the patient's name.

Before I arrive at the office in the morning, or late in the afternoon of the

has the leisure, work that has actually been accomplished is noted on Card A with the date. On Card B is placed the interval of time consumed. The record is then complete and is placed in the regular file.

The plan of having the entire history of the case at hand so that it is always before me, when patients are in the chair, is a great help in many ways, and if one acquires the habit of jotting down just what is done at the time that it takes place it soon ceases to be a burden. With the time consumed, the appliances and retainers used noted on the card, it is very easy to check up your mistakes and the inefficiency of appliances or retainers used in the correction of the different classes of malocclusion.

At the end of treatment, the time consumed at the chair, may be found in a few minutes, and this with the number of appliances used will give a definite idea of what our fee should have been in the treatment of such a case.

If an index is kept for any length of time, it will show the average time consumed in correcting the malocclusion occurring in the different classes and giving a solid foundation for estimating the amount of our future fees for such a condition.

To sum up: the main features that I have found a help to me in this system are:

- 1st. The compactness of data in each case.
- 2nd. Of having it before me every time the patient is in the chair.
- 3rd. Knowing at a glance at any hour of the day, just what work is before me.
- 4th. Being able to jot down when it is fresh in my mind, with no loss of time.
- 5th. To know what appliances have been used during treatment.
- 6th. And know the time consumed during the treatment of a case.

HISTORY OF ORTHODONTIA

(Continued from page 32)

BY BERNHARD WOLF WEINBERGER, D.D.S., NEW YORK CITY

CALVIN S. CASE, M.D., D.D.S., 1847.—The writings of many men who attained national and international prominence have been recorded in this historical resume, but few in the pursuit of their professional activities have written more on the subject of orthodontia than Case.

Before the *Columbia Dental Congress* in 1893, Case presented one of his first papers on *The Esthetic Correction of Facial Contour*. Like Farrar's, this



Fig. 1.—Dr. Calvin S. Case.

paper was practically forgotten until Angle in 1911 reintroduced the subject of *Root Movement*. Eighteen years elapsed before men in the practice of orthodontia began to pay a great deal of attention to this important phase of their work.

In this paper Case not only showed the possibility and advisability of changing the position of the malposed teeth in regulating, but also of applying force in such manner, when necessary, as to produce anatomic changes in the bony tissue adjoining the teeth, thus bringing the parts into harmonious and esthetic relations with the other features.

To do this he said, "It would be necessary to move the roots of the teeth as

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well as the crowns so that any overfulness or deficiency in the root region would be changed to a condition of normality and harmony."

This root movement, either labially or lingually, he accomplished by devising a method of applying force well up opposite the roots of the teeth which served the same purpose as though the roots themselves were operated upon directly by the mechanism. This was accomplished by soldering short stiff bars to the bands upon the teeth to be moved and having these bars extend upwards outside of the gum to a point midway of the length of the roots. Force exerted in a lingual direction by means of an arch wire passing over these bars near their free ends and operating through a tube attached to the molar anchor bands would compel lingual movement of roots, whereas force applied in the opposite direction, by having the arch wire press against the under sides of the rigid bars, would force the roots in a labial direction. In either case the moving roots would carry with them the surrounding alveolar tissue producing the anatomic changes desired.

The paper was accompanied by models showing how such movements had been accomplished in actual cases in practice. A paper of similar purport had been read by him before the *Chicago Dental Society*, in *February* of the same year, describing a case operated along these lines during the previous year.

Beside the root movements in this first case the entire mandible needed retracting and this was accomplished, or at least aided, by the use of intermaxillary elastics operating between buttons attached to the upper and lower appliances.

It will be noticed that although both *Dr. Baker* and *Dr. Case* employed intermaxillary elastics at nearly the same time, there was this slight difference in the two procedures; *Dr. Baker* employed the elastics for the sole purpose of protruding the mandible and effecting a normal occlusion, while *Dr. Case* employed them to retract the mandible and as an auxiliary to an operation for the labial movement of the upper incisors, teeth and roots.

Although *Dr. Case* started to write for dental journals in 1881, his first paper pertaining to orthodontia was read before the *Michigan State Dental Society* in 1888, (*Ohio Dental Journal* in 1888) and was on the question of *The First Permanent Molar*. In 1890 in the *Dental Cosmos*, page 908, we find a paper entitled *The Angle System in Orthodontia*. In this he describes the important features of this system, as well as a "*Jacket and Traction Screw*." *Orthodontia—A Practical Case*, *Dental Review*, page 531, 1892, he states:

"The only apparatus that was used to overcome the prognathous position of the teeth and jaw was a simple band extending from the molars around the front teeth; the ends of the band were soldered to German silver wire bars (No. 19 E. s. g.), which were threaded and passed through long tubes, or pipes, attached to the buccal surfaces of the banded first molars. The first bicuspid were banded and carried short pipes in which the bars loosely rested, to aid in giving greater stability to the anchorage by preventing the molars from tipping forward.

"The centrals were also banded and possessed lugs for holding the traction band in position.

"Fig. 2 represents a model made from an impression taken during an intermediate stage of the operation with the traction apparatus in position. The interproximal spaces are closed and also the space nearly closed where a bicuspid had

been removed. The left second bicuspid was also removed about this time. The plate that was worn is laid upon the model.

"The nuts were never turned so as to give a painful tension to the traction band, and the apparatus was worn from the beginning to the end of the operation with comparative comfort and so little mental and physical derangement that school duties were never interrupted on this account.

"This I consider one of the most important factors in correcting every case of malposed teeth, compared to which time is a matter of every consequence. If there is anything distasteful to me it is to hear the much vaunted expressions relative to ease and shortness of time in which certain *skillful* operations were or can be performed; and especially a case in orthodontia, the treatment of which should always be kept subservient to the physiologic demands of nature, regardless of time."

Before reading his paper at the *Columbia Dental Congress* on "*Root Move-*



Fig. 2.

ment" Case published an article on *The Application and Influence of Force in Orthodontia*, *Dental Review*, August, 1892. It is in this treatise that Case first mentioned *Root Movement*. He says:

"To those, therefore, who hope to be eminently successful in this department I wish to emphasize the importance of thorough training in the foundation principles. Know well the possibilities presented by nature; the principle of force and its proper application and management; then if you will adopt some system in the main whereby the appliances may be constructed under your immediate supervision—permitting a freedom of ingenuity not possible in an attempt to use some particular set already in the market—a far more perfect treatment of malposed teeth will be given, suited to the needs of particular cases in hand.

"In the short time allotted to a paper I shall attempt to give only a few thoughts relative to the principles of force in the correction of irregularities of the teeth, dwelling more particularly upon the influence which different ways of attaching the appliance have in the production of certain movements—on the one

hand to obtain all the advantage which the force employed affords in producing the greatest amount of movement, and on the other, of so distributing or managing the anchorage force that little or no movement of other teeth is produced.

"In correcting the positions of malposed teeth, it should never be forgotten that the important and indispensable part of the operation is to so regulate the force that the normal functions and healthful conditions of the teeth and surrounding tissues are preserved, and that nature will permit their movement, physiologically, only so rapid as she is able to take care of the broken down tissue of retrogressive metamorphosis, caused by pressure of the tooth upon the walls of the alveolar socket. The rapidity of the movement will be influenced largely by the age of the patient, and differ as other things differ with people.

"The point which interests us under the caption of this paper relative to the application of force may be stated as follows: as soon as the applied force over-reaches the possibilities of natural (and I may say physiologic) change—the surplus is liable to spend itself in producing some undesired and unlooked for condition. In other words, nature can only work so rapidly, and any attempt to force her beyond her natural powers will result—if not in disaster—certainly in a misdirection, and transference of the force to other parts which should not, and would not, otherwise be disturbed. For instance, it is not always possible to move the apices of the roots of teeth in the same direction that we are able to move the crowns and it is usually quite important to avoid moving them in an opposite one.

"On account of the relatively hard surface layer of alveolar process, there is always a tendency for it to act as a fulcrum over which the tooth is tipped; but fortunately the apical region of bone in which the roots are embedded usually presents sufficient resistance for it to remain as the true and immovable fulcrum of the lever so long as force is not increased beyond the powers of absorption in other portions of the socket. The moment this does occur, however, the peripheral surface of the alveolus becomes the fulcrum while the load is delivered to the end of the root in the opposite direction, and in exact proportion to the surplus force. If we admit that the apical portion of the socket—blending as it often does with the cortical layers of true bone—presents greater resistance to changing the positions of that portion of the root, there can be but one conclusion; viz.: So long as the pressure is kept within physiologic bounds, it makes little difference in regard to the length of the arm of the lever, or, in other words, whether the force is applied near the occluding surface of the teeth or at the cervix, provided always that it is not restricted in its action by the method of attaching the appliances."

Some Principles Governing the Development of Facial Contours in the Practice of Orthodontia, Columbia Dental Congress, 1893, vol. ii, page 727. This was the first published presentation of bodily movement of the teeth, as well as the use of the intermaxillary force.

"The practice of correcting irregularities of the teeth has advanced so rapidly under the influence of modern methods of constructing regulating appliances, that it bears today little relation to dentistry proper, and in its most advanced practice may justly claim a distinct field in art and mechanics. Nor is the prophecy a wild one, that the science of orthodontia is destined to cover a still wider and more

peculiarly distinct field—that we are at the beginning of a renaissance in this department which will not rest or be satisfied with the mere correction of malposed teeth, but will include as an indispensable part of its repertoire the correction of all facial deformities which have resulted from irregularities of the teeth and jaws, and, in fact, the development of every esthetic contour of the face that can be accomplished by a scientific application of force to the underlying bony structure through the medium of the teeth.

“In the ordinary dental practice of correcting irregularities of the teeth, not enough attention has been given to facial effects; the principle aim having been to bring the teeth to a more perfect position and occlusion. While this has usually resulted in an improvement in the appearance of the face even when the features were in repose, the development of facial contours from an aesthetic standpoint seems rather to have been a result than one of the principal aims of the operator. I refer particularly to those cases that have been discharged as satisfactorily finished when the crowns of the teeth have been brought to a more perfect alignment, with little or no regard to the movement of the roots and the bony structure in which they were embedded. In many instances, too, had this latter movement been accomplished, as would not have been difficult with our present possibilities, there would have been a vast improvement in the general form and contour of the face; and this higher esthetic attainment would have been considered the most important part of the whole operation, producing a satisfaction and pleasure unequaled by few things in orthopedic surgery.

“*Dr. Farrar*, in the two volumes which were published of his valuable work on *Irregularities of the Teeth and Their Correction*, gives very little space to this branch of his subject; and then in reference only to the movement of the entire tooth in a lateral direction. On page 647 he says:

“The lateral movement of the entire tooth has always been regarded as difficult; and (in referring to successes claimed by the author) *Dr. Guilford* has even gone so far as to state in some remarks he made at a meeting in 1888, that he had always been “inclined to doubt” the accomplishment of the operation. Not only have I performed the operation several times, but I have advised its performance by others who have found it to be fully successful.”

“It can be seen by these remarks that the movement of the roots of teeth is a rare and somewhat modern accomplishment, and doubtless an operation which never would have been possible under the old regime of regulating plates and their numerous force contrivances.

“He further very perfectly states the following axiom, the only method by which a movement of the roots in the direction of the force is possible: “The secret of effecting a lateral movement of the roots of the teeth lies in relatively fixing the antagonizing ends of the crowns while the force is being applied at their necks.” In another place he restates the same proposition thus: “For the lateral movement of roots the power should be applied between the fulcrum and the point of resistance, or weight.” Then he follows this by a beautiful illustration of this principle of force with a number of ingenious contrivances by which a lateral movement of the roots of the teeth has been effected.

“The purpose of this paper is to show how, with our present possibilities in the construction of regulating appliances, this principle of force may be also

applied to the movement of the roots of the teeth in any direction, and to illustrate also the importance of this possibility when it is observed in the operation where the teeth are moved in phalanx, that the bones of youth do not remain stationary to be plowed through by the roots in a process of retrogression metamorphosis, but that a considerable portion of the bone in which the teeth are embedded is carried with the roots in proportion as they are changed in position, thus enabling one to regulate many imperfections of the face by changing the shape and surface contour of the frame which supports and gives character to the features over all that portion which can be affected by a movement of the bones contiguous to the roots of the teeth.

"I shall be able to show by models to your perfect satisfaction, I think, that this movement of the roots and adjoining bony structure may be made to influence a far greater area in shaping the features of the face than would at first seem possible; and especially is this true over that part of the face contiguous to the roots of the anterior superior teeth, even to the changing of the shape of the nose.

"I am now able to correct, with perfect certainty of success, any marked depression or protrusion of the upper lip which is mainly due to a malposition of the roots of the incisor teeth. Instances are often observed among the youth who demand our professional services, which show a comparatively perfect alignment and occlusion of the teeth, and yet because of the position of the roots with a consequent abnormal depression or protrusion of the adjoining bone, considerable imperfection of features and external contour of the face is produced. These deformities are peculiar and not common, but have rarely engaged attention with a view of orthopedic treatment directed to the development of a more esthetic facial form. In the instance of a marked depression of the upper lip, as in Classes 1 and 2, they are often mistaken for a prognathous lower jaw, because of the lack of proper fullness in the central features of the face, which frequently affects the shape of the nose and deepens the lines on either side. For the same reason the cheek bones will appear at times abnormally prominent, giving to the face a broad and flattened appearance, especially if the cuspids being retarded in their eruption for the want of room take a more lateral and prominent position. If the lower teeth are in proper relative position and the deformity caused, as is most common, by the lower incisors occluding in front of the upper, every change desirable may be effected by an appliance attached to the superior teeth alone.

"On the other hand, if the entire superior dental arch is narrow and contracted with a high palatal dome, the teeth long, uncrowded and not materially affected in position by occlusion, the face will usually be long and narrow, the nose prominent, thin and of Roman type. In these cases the entire dental arch and alveolus should be expanded, and the force so applied and controlled as to retain the teeth in an upright position, especially in the process of carrying the anterior teeth forward, which is of vital importance in the restoration of the features of the face. The principal force, therefore, should be exerted upon the anterior superior teeth; and this force may be reciprocated by rubber bands extending from the posterior part of the upper appliance to the anterior part of an appliance that is attached firmly to all the lower teeth. These bands can be made to exert almost any desired force, according to the heft of the tubing from which

they are cut; and their positions being such as to not interfere with mastication, they can be worn continuously.

"If the inferior dental arch is large, with the teeth occluding outside of the alignment of the superiors, it may be reduced in size by the extraction of a bicuspid on either side and the anterior teeth forced back to fill the space. If, however, the chin is abnormally prominent below the incisive fossæ, teeth should not be extracted from the lower jaw, the principal change to correct the facial deformity should be accomplished on the upper jaw, as in Case 5.

"I have abandoned all attempts to reduce a prognathous lower jaw by external pressure upon the chin, never having derived the same satisfaction from this operation that others claim. I find, however, that the rubber bands, before mentioned, extending from the upper and lower appliances can be made to exert all the force the patient can stand at the glenoid fossæ, and doubtless this influence tends to force the lower jaw to a more posterior position.

"On the other hand, with equal facility, I am able now to reduce a protrusion of the upper lip at that point where it merges into the nasal septum and orifices, when due to a malposition of the roots of incisor teeth alone, causing an abnormal prominence of the anterior nasal spine and incisive fossæ. This position of the roots of the superior incisors is not uncommon, even when the antagonizing ends are in perfect position; and often with the production of quite a marked facial deformity. As an illustration of this, I call your attention to the models of Case 6.

"In like manner, I am able to force the anterior *inferior* teeth bodily forward, with the entire alveolar ridge in which they are embedded. Instances are not rare where the point of the chin, the upper lip, and the anterior superior teeth are relatively in proper position, but with inferior teeth, from various causes, so posteriorly placed as to produce an abnormally deep depression or curve, in that portion of the lower lip along the line of the incisive fossæ. By forcing the anterior superior teeth forward, with the alveolus in which they are embedded, a more esthetic shape will be given to the chin; and this change, though slight according to measurement, will often produce an improvement in the general appearance of the face that is quite remarkable. The same is true, also, in a posterior movement of the inferior incisor teeth and alveolus, when they are so anteriorly placed in relation to the point of the chin as to obliterate the graceful curve of the lower lip.

"I believe that all who have made a study of this particular line of work will agree with me that a large proportion of all facial imperfections—which in many instances amount to actual deformities—are due to an inartistic relation of those features of the face whose form and contour are governed by the position of the teeth and the peripheral surface of the bone in which the roots are embedded. If, therefore, it is a fact that by force appliances attached to the crowns of the teeth of young persons the roots of the alveolus can be forced outward and inward to any desired extent, a new field will be opened to the practitioner in orthodontia, a principal feature of which will be the correction of many deformities of the face that have heretofore been considered beyond the reach of orthopedic surgery.

"In a large proportion of these deformities which seem to be due to protru-

sion or recession of the chin, it will be found upon a careful study of the face that the chin is not far from its proper relative position to the forehead, the upper portion of the nose, and malar prominences, and that the deformity in the main is due to the relatively imperfect position of the middle features of the face, governed by the anterior superior teeth and the adjoining bone in which they are embedded.

"If now, by ordinary methods, the crowns of these teeth are forced back-

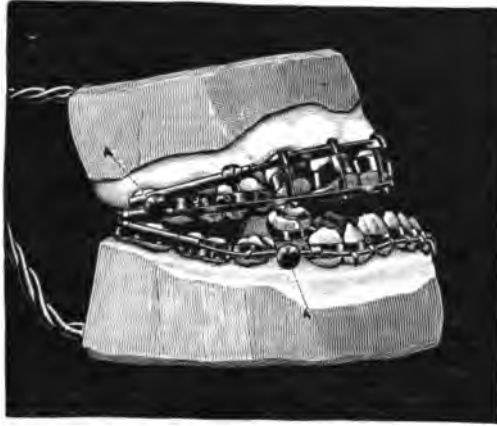


Fig. 3A.



Fig. 3B.

Fig. 3B.—Modern contouring appliance adopted later by Case.

ward or forward to a more perfect alignment with the lowers, the facial defect is only partially remedied and the real deformity far from being removed, if not increased, as it may be, by the tendency of the roots to tip in an opposite direction. But if, on the other hand, the teeth are firmly and substantially grasped by appliances which are so constructed that the force can be applied directly to the roots while the antagonizing ends of the crowns are fixed or controlled in their movement—as *Dr. Farrar* has outlined for the lateral movement

of the entire tooth—it will be found upon trial that the roots as well as the immediately surrounding bone will be removed, and can be made to take a position which will give a far more pleasing appearance to the face.

"The peculiar apparatus which I use for applying force to the roots of the anterior teeth in facial contouring was first put into practical use December 24, 1892, and described in connection with a paper I read before the Chicago Dental Society the following February, which was published in the March, 1893, number of the *Dental Review*.

"Before describing the peculiar construction of the contouring apparatus I use in these cases, I wish to say that I endeavor to have all regulating appliances made as substantially and finished as perfectly as a piece of jewelry. The bands are fitted to the natural teeth with as much perfection—especially where they extend under the free margins of the gum—as a band for a crown. I use German silver principally, and heavily gold plate the apparatus before attachment.

"Too much praise can not be given *Dr. Angle* for introducing to our notice the value of German silver for this purpose, and also for many original ideas in the construction of regulating appliances.

"In constructing an apparatus for forcing the roots and adjoining bone of the anterior teeth forward, wide German silver banding material for the teeth should be selected, that is, five or six thousandths of an inch in thickness. This should be fitted to the crowns of the anterior teeth near the margins of the gum, perhaps extending beneath the margins on the proximal sides. Then bars of No. 18, E. S. G. wire, slightly flattened, should be soldered to each of the bands in an upright position, and bent so as to lie along the anterior surface of the crowns from the apex to where the bars join the band; here they should take a direction somewhat parallel to the gum; but free from the surface to about one-sixteenth of an inch above its margin, at which point they should be flattened or thinned so as to be more easily bent forward, and firmly clasped around a rigid bar which is made to extend from anchorage tubes attached to the posterior teeth. (See Fig. 3A.)

"This bar, which should be very rigid, is drawn without annealing from a No. 12 extra hard German silver wire to No. 18 (E. S. G.). The ends are threaded in the No. 4 hole of the *Martin* screw plate, and the central portion is slightly flattened in the rollers. Then it should be bent so as to rest when in proper position in the unclamped ends of the upright bars that have been left open to receive it. Before placing it in position, the nuts should be screwed on to work at the anterior ends of the tubes.

"This apparatus can be made to exert an exceedingly powerful force, but if put into practical use as it now stands, the ends of the roots and the adjoining bony structure would not be forced forward, notwithstanding the fact that the power is applied directly to the roots somewhat above the crevices. The crowns and the body of the roots, with a portion of the alveolus only, would be moved forward.

"To complete the apparatus, therefore, the fulcrum should be removed from the anterior alveolar plate and placed so that the power can be applied between it and the ends of the roots to be moved. In other words, the crowns should be

restricted or controlled in movement so that the applied force may be directed to the roots alone.

"I accomplished this by a second bar much smaller and thinner than the first, but proportionately rigid, which rests in depressions in the upright pieces along the occluding ends of the teeth. The ends of the fulcrum bar are threaded and passed through tubes that are soldered to the anchorage bands on each side below the power bar tubes, with nuts which work posteriorly to the tubes.

"An apparatus for reducing a prominence of the features by exerting a posterior force upon the roots of the alveolus of the anterior teeth, is constructed in a similar manner to the one just described, with the following exceptions: (1) The bands should be fitted to the crowns of the incisors near their occluding ends, for the purpose of obtaining a more rigid bearing in the changed application of force. (2) The lower ends also of the upright pieces should be made to clasp the fulcrum bar. (3) The nuts should be reversed in their relative positions to the tubes (which goes without saying). (4) The most difficult and equally important part of our task will now consist in moving the roots of the cuspids, if they are prominent, but their position is such if much force is applied with the present arrangement of the apparatus, the bars will slip through the clasps at the ends of the upright pieces. Therefore some provision should be made to prevent this, which may be accomplished by short sections of pipe clasped around and soft soldered to the bars.

"In considering the mechanical qualities of the contouring apparatus I have outlined, I wish to direct attention to the fact that the force expended at the anchorage attachments is largely neutralized by the reciprocating influence of the two forces, and this reciprocation is always equal to the power used on the fulcrum bar in preventing a movement on the occluding ends of the crowns. The balance of the power, which may be considerable in the general movement of the parts, must be sustained by the anchorage teeth, if not further neutralized by other auxiliaries.

"When the central features of the face are depressed with anterior superior teeth occluding posteriorly to the lowers, accompanied with the usual real or apparent prognathous lower jaw, great reciprocating force may be beneficially obtained from the rubber bands before mentioned. Rubber rings are cut from a three-eighths inch rubber regulating tube of good heft, and passed over the projecting ends of the anchorage tubes or buttons, on the upper appliance to buttons on a lower appliance opposite the first bicuspid. (See *A. A.*, Fig. 3A.) The latter appliance may be so constructed that the force will be distributed to all the inferior teeth, and indirectly to the jaw, forcing it to a more posterior position. Or it may be that the first bicuspid have been extracted, for the purpose of forcing the six anterior teeth back. In either case the elastic force of the rubber bands can be made to do effective work to the full extent of the power on both the upper and lower jaw, neutralizing force which otherwise would be expended upon a static anchorage.

"They are useful also as an auxiliary in the reduction of a prognathous upper jaw by reversing their attachments. In these cases I also make use of the occipital force, largely for the advantage I obtain in forcing the anterior teeth further into

their sockets. Cases of prognathous upper jaw with protruding teeth are rare in which there is not an abnormal prominence at the base of the nose. When force is applied to the crowns alone of the anterior teeth, this prominence may become more pronounced, even though the position and appearance of the teeth and the face are improved by the operation.

"In these cases, therefore, I consider it quite as important to move the roots as well as the crowns of the anterior teeth, when by so doing I find I am able to remove the entire deformity and greatly improve the general form of the face.

"I wish to say right here that time is a matter of little importance to me compared to the possibility of accomplishing the desired result without harm to the teeth or special local or systemic disturbance."

Abnormal Lateral Bite, Dental Review, 1895, page 538, *Case* states:

"One of the most difficult, and for a time, discouraging cases of irregularity of the teeth I have ever treated was that of a girl about fifteen years old, whose



Fig. 4.

masticating occlusion carried the chin so far to one side of the median line when the jaws were closed that it produced a marked facial deformity which was far more noticeable because of the natural perfection and delicate chiseling of her features.

"In this and other cases of a similar character I have since treated, the extent of the abnormal closure was not caused wholly by jumping the cusps laterally, but was partly due to the general tipping of the teeth to more nearly approach perfect occlusion. That is, the upper teeth were all tipped in the direction that the lower jaw was carried, while the lower were tipped in the opposite direction to more or less fairly meet their occlusal surfaces. Nor was this peculiar attitude confined to the posterior teeth; the anterior teeth also partook of the same general posture.

"Now it will be seen at once that to correct such a deformity all the teeth must be tipped back to their sockets to assume their natural upright positions, and

their occlusion so adjusted that the abnormal posture of the lower jaw will not be necessary for mastication.

"The advantage of this principle has been practically demonstrated by the inclined plane since the dawn of regulating teeth, but beyond this infernal machine its various possibilities seem to have been lost sight of.

"The extending of rubber bands from the extreme buccal endings of an appliance attached to all the upper or the lower teeth to points upon the occluding set opposite the first bicuspid has become a common one in my practice in nearly all cases where there is an abnormal anteroposterior relation of the upper and lower anterior teeth.

"In Fig. 4 *a* is a traction screw bar which is attached to the right cuspid at one end and at the other to the left bicuspid. Upon this bar is a sliding tube *b*. Against a spur soldered to one end of this tube rests a jackscrew *c* which exerts its power against the left cuspid. At the other end of the tube *b* rests another jackscrew *d* which exerts its power against the right bicuspid.

"A moment's thought will convince one that with this apparatus the bicuspid

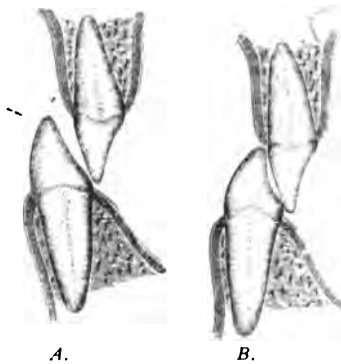


Fig. 5.—*A* represents original position of central; *B*, the present.

must be moved to the right, while the cuspids are moved to the left. Its important possibility, moreover, as an object lesson, lies in the fact that the operator has complete control and direction of his power. For instance, if it should be found, as probably will occur, that the right cuspid takes its proper place before the left, it may be held back by the tube *b* being forced against it by the jackscrew *c*; the traction bar now extending all its power against the left cuspid. This force against the left cuspid can be augmented at any time by the jackscrew *d* exerting its power against the right bicuspid. Or the right bicuspid can be made to receive all the force exerted upon the left cuspid."

"The Esthetic Correction of Facial Contours in the Practice of Dental Orthopedia, Dental Cosmos, 1895, page 905.

"In answer to numerous inquiries, I have decided, in this connection, to describe and fully illustrate some of the important features of the latest methods I have adopted in the construction and application of the contouring apparatus.

"I do this with the hope that some of the difficulties I encountered in my first cases may be avoided by you, and which were partly due to the comparative

crude construction and application of the apparatus I used then and published in my early writings upon this subject.

"The limited area upon which force can be applied to a tooth, compared to that portion covered by the gum and embedded in a bony socket, has made it next to impossible, with all ordinary methods, to move the apex of the roots in the direction of the applied force; nor could this ever be accomplished with force exerted in the usual way at one point upon the crown, however near the margin of the gum it be applied, for the opposing margin of the alveolar socket must receive the magnitude of this direct force, and in proportion to its resistance it will become a fulcrum, exerting a tendency to move the apex of the root in the opposite direction.

"But if in the construction of the apparatus a static fulcrum is created, independent of the alveolus, at a point near the occluding portion of the crown, while the power is applied at a point as far upon the root as the mechanical and other opportunities of the case will permit, the apparatus becomes a lever of the third kind, the power being directed to a movement of the entire root in the direction of the applied force.

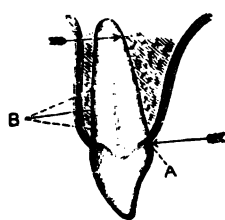


Fig. 6.

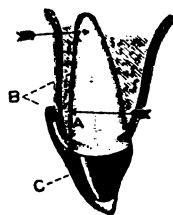


Fig. 7.

"This proposition is made plain by reference to the diagrams. In Fig. 6 let *A* be a point upon a central incisor, at which force is applied in the direction indicated by the arrow, then will the opposite wall, *B*, of the alveolar socket, near its margin, receive nearly all of the directed force, and in proportion to its resistance will there be a tendency to move the root on the opposite direction. This proposition will also hold good even if we apply the force at *A*, Fig. 7, or as far upon the root as may be permitted, by attaching a rigid upright bar, *C*, to the anterior surface of the crown; the only difference being that we distribute the direct force over a greater area. But if, as in Fig. 8, we attach to the lower end of *C* a traction-wire or bar, *F*, and further enforce the mechanical principles of our machine by uniting its posterior attachment to the anchorage of the power bar *P*, we will have neutralized our anchorage force materially and created an independent static fulcrum at *D*. Our apparatus now will distribute its force over the entire root, and give us complete direction and control of whatever power we put to it.

"The entire tooth can be carried forward bodily, or either end can be made to move the more rapidly. The force thus directed to the ends of the roots will have an increased tendency to move the more or less yielding cartilaginous bone in which they are embedded.

"The construction of the anchorage attachment which now remains to be

described is of the greatest importance to the ease and accuracy of its application and its subsequent usefulness.

"Two molars, or the first molar and a bicuspid, and sometimes all three, should be selected for the anchorage teeth. When these are accurately fitted with wide bands, an impression in compound, of one side at a time, including the cuspids, should be taken. The bands should then be removed from the teeth without bending, and carefully placed in their proper position in the impression, which should be filled with Teague's or other investing compounds. You now have the bands upon a small model that will hold them firmly in their proper relative positions during all the soldering process.

"As the position and mechanical perfection of the power tube (Pt, Fig. 8) is of paramount importance, it should receive first attention.

"Select a strong tube one-half to three-fourths of an inch in length, that

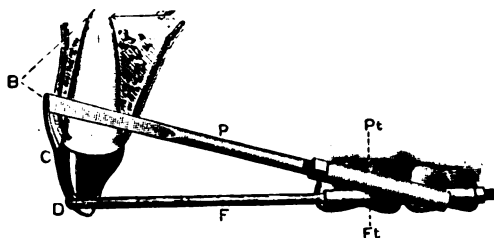


Fig. 8.



Fig. 9

loosely fits the threaded end of the bar. Its anterior end should be placed so that the nut will work freely upon the bar without impingement upon the band, tooth or gum, and it should take a direction that points exactly to that place upon the cuspid over which the power bar is to extend. In order to strictly observe this important direction, it usually becomes necessary to raise one or the other end of the tube from the bands by the intervention of lifts. It is often convenient to rest its posterior end upon the lever tube, its sharp projecting edges being rounded so as not to irritate the cheek.

"The lever tube (Ft, Fig. 8) should also loosely fit its bar or wire, and be soldered directly to the bands, which it firmly unites, and thus serves to give statical strength to the anchorage. Their direction is not as material as that of the power tubes, because of the smallness and flexibility of the lever wire. Their posterior ends should project sufficiently free from the other parts to admit of the working of the nut. And in those instances where reciprocating rubber bands are to extend to a lower appliance—the advantage of which has been explained else-

where—I allow these tubes to project for that purpose, finding them much more convenient than the buttons which I formerly used.

"The tubes now being fitted with their joints turned toward the bands, they are attached with an abundance of silver solder, the bands also being united along their approximal surfaces.

"With the anchorage appliance and power band in place, the bands for the anterior teeth may now be fitted and cemented, allowing the upper ends of the upright bars to rest in front of the power bar. Finally, the lever bar is laced, and the contouring apparatus is ready to commence the application of force at the next sitting.

"An apparatus for moving the anterior teeth in the posterior direction is in the main constructed quite similarly. (See Fig. 9). The power bar is now being used for traction force, the same rigidity is not as necessary as in the other apparatus. I find, therefore, that a No. 16 wire, not flattened in front, is of sufficient size.

"The other, or lever bar, the force of which acts in the opposite direction to prevent the occluding ends of the teeth from being drawn back, should be as large as No. 18. It should be flattened in the same manner described for the power bar. The upper ends of the upright bars are grooved on their anterior surfaces to form a rest for the power bar; while a shoulder is filed on the posterior surface of the lower ends, which forms a slot, when in place, for the flattened lever bar to rest.

"It being understood with this apparatus that the power bar nuts work at the posterior ends of the tubes, while those of the lever bar work at the anterior ends. Proper provisions for this arrangement should be made when constructing the anchorage appliances."

Principles of Force and Anchorage in the Movement of Teeth, in the *Transactions of the American Dental Association*, 1897, page 89, Case states the following:

"While the teeth differ in shape from each other and from the postlever I have described, and while their alveolar surroundings do not present a uniformity of resistance to their movement and therefore while we can not calculate force and motion with mathematical accuracy, still the fact that they are embedded one-half their length in a yielding substance and subject to the frequent application of force for the correction of irregularities, the only way by which we can approach an exact science in the application of power for their movement is to consider them as levers propelled by a machine doing work on the tissues in which they are embedded.

"When power is applied at one point to the crown of a tooth at right angles to its long axis, it becomes a lever with combined qualities of the first and second kinds; it is one more than the other in proportion to the relative difference in the resistance between cervical and apical portions. And while the relative proportion of movement at these points will be governed largely by the stability of their bony surroundings, it may be influenced considerably, as with the post-lever, by the position upon the crown at which power is applied. For instance, in the construction of an appliance for the retrusion or retraction of the incisors with a

traction wire extending from molar anchorages, if we wish the least movement possible of the roots in the opposite direction, the wire should rest upon the incisors as near to the gingival margins as the gums will permit. I usually solder to the bands upright bars which extend to the highest points of the exposed faces of the crowns. Grooves or rests are cut at the upper ends of these for the wire, enabling it to span the interproximate gingivæ. (See Figs. 10 and 11.) I frequently extend these bars above the gum-margins, as shown in Fig. 12, in order to apply power that is equivalent to direct force upon the roots at points above the margins of the alveoli, and I wish to say that I find these procedures of the greatest importance in arriving at results for which they are designed."

Dr. Case, then reviews the paper above reported as a further description of his method.

"When great immobility of a single anchorage tooth is required, use for banding material German silver or platinized gold, No. 30 gauge, and as wide as the tooth will permit. When these are encountered and fitted, solder the power



Fig. 10.

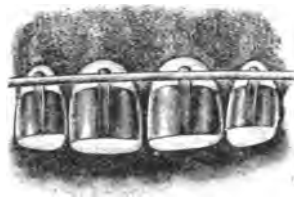


Fig. 11.

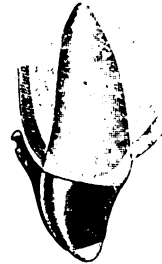


Fig. 12.

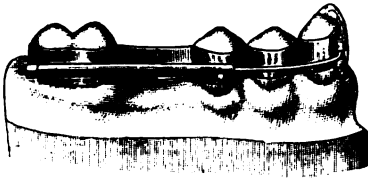


Fig. 13.



Fig. 14.

tube at the gingival margin. (See Fig. 13.) This should be sufficiently long to permit reinforcing it at either end with solder to the full width of the teeth, and large enough to carry a power rod that will be inflexible. Where it is possible, the power tube may rest above the gingival margin, soldered to an extension plate that is fitted or swaged to the surface of the crown and so shaped as to freely clear the gum.

"If the power tube is extended forward to the first bicuspid and its anterior end allowed to rest upon a narrow projection soldered to the bicuspid band, it will add greatly to the stability of the anchorage.

"It will be seen that any tendency of the molar to tip forward will carry the anterior end of the tube almost directly toward the root of the bicuspid, the movement being prevented by the rest. (See Fig. 14.) Nor will such a device offer

any special obstruction to the movement of the bicuspid, the rest sliding along the tube.

"It is often more convenient to sustain the anchorage with a flattened bar soldered to the lingual aspect of the molar band which extends to and engages with rests upon the bicuspid. This is especially applicable where it is desired to reduce an anterior protrusion with a small flexible traction wire encircling the teeth. Frequently the lower cuspids are anteriorly prominent, the incisors are crowded, irregular, and somewhat extruded, but not protruded,—in fact, they are frequently retruded, presenting one of those cases where the extraction of a bicuspid is indicated, were it not for the fact that the first molar on one or both sides is missing. Here the anchorage for forcing back the cuspids with a buccal bar may be sustained with a tube, instead of a flattened bar, which extends along the lingual aspect of the bicuspid, but not supported upon rests. An inflexible rod is fitted into these tubes (one on each side), and engages with hooks soldered to the incisor bands. (See Fig. 15.) If the incisors are retruded, the ends of the bar may be threaded for nuts at the anterior ends of the tubes to force the incisors forward, the two forces being reciprocatory. It will be seen that any



Fig. 15.

forward tipping of the molars will be prevented by the incisors sustaining the anchorage support, the force tending to intrude the incisors."

New Methods and Appliances in Orthodontia, Dental Review, 1898, page 573, Case states:

"The demands of a practice that is limited to dental orthopedy and the construction of artificial vela has led to the invention and practical application of so many ways and methods that are distinctively individual, that I am able to say today that everything in my practice covering every variety of movement of malposed teeth from the very beginning, where the material and implements to the final retaining appliances, is characterized by personal ways and means.

"I do not wish to be understood as implying by this that I have not been dependent upon the thought and skill of other men to whom I shall always feel grateful—for that foundation which has enabled me to build this system of practice. To *Dr. Edward H. Angle* I am principally indebted. In fact, it was by following his method, at first, of constructing regulating implements and finally seeing the almost unlimited opportunities presented by building a regulating apparatus upon bands cemented to the teeth, that led me to specialize my practice to this branch of dentistry.

"To *Dr. Norman W. Kingsley* I am indebted for the foundation to my system of constructing artificial vela.

"While this expander will probably always hold an important place in my practice, I have been using of late another form which is quite as effective in most cases and much easier to construct. (See Fig. 16.)

"A German silver wire should be selected for the lingual bow of sufficient size (B. and S. g. No. 14) to perform its work at the distal ends without bending. That portion which rests back of the incisors is filed flat to about one-third or one-fourth of its diameter in thickness.

"In the process of soldering the rests for the jackscrew as shown in Fig. 16, the temper is removed from the flattened portion so that it can be easily bent. It will be seen that the expansion of the anterior portions of the arch will be in proportion to the amount of curvature given to the flattened part. For instance, when the flattened part has come to a straight line by the outward pressure of the jack, or has been made straight in the first place, as shown by *A*, Fig. 16, no



Fig. 16.



Fig. 17.

further expansion can occur between these points. The entire power will then be directed to the expansion of the distal portion of the arms.

"Class 2. One of the most common forms of irregularity is in those cases where the proper eruption of the cuspids has been retarded or prevented for the want of room. When this is due to the premature extraction of the deciduous cuspids the space will frequently be entirely closed by the adjoining permanent teeth. An apparatus that is admirably adapted for the correction of this form of irregularity is shown in Fig. 17.

"The object to be obtained is to force the bicuspid and incisors back to their proper relative positions sufficiently to give room for the cuspid and at the same time produce a symmetrical arch."

In the *Dental Cosmos*, 1904, page 345, is an article *Origin, Use and Misuse of the Intermaxillary Force, and Its Relations to Occipital and Other Anchorage Forces*, giving correspondence, etc.; as well as dates as to the priority in the use of intermaxillary elastics, and force.

In 1908 Case brought out his book entitled *Dental Orthopedia*.

Dr. Case's contributions to orthodontia are numerous, so that it will be impossible to review them all at this time.

Case's classification is interesting in so far as to the complication of same. He has divided this into two sections, one on page 194, according to group, the other on page 260, according to classes. The combined classification embraces twenty-six divisions. The idea of the second grouping was to illustrate the type of appliance to be used in each class.

"In the author's opinion it is unscientific to place in one class malpositions which, though similar in occlusion, produce widely different facial deformities and consequently demand widely different methods of treatment.

"In this work therefore irregularities are divided into two general divisions. In the first division are placed conditions that are not susceptible of classification. These are named *Simple and Complex Irregularities*. They are divided into six groups. In the second, or classified, division, are placed distinct types whose correction is dependent upon the effect they produce or are destined to produce upon the physiognomy. These are named *Dentofacial Irregularities*. They are divided into seven classes."

TABLE OF GROUPS

- Group 1. Intrusion and Extrusion.
- Group 2. Malalignments.
- Group 3. Maltured Teeth.
- Group 4. Contracted and Expanded Arches.
- Group 5. Abnormal Interproximate Spaces.
- Group 6. Impacted Teeth.

CLASSES OF DENTOFACIAL IRREGULARITIES

- Class I. Maleruption of Cuspids—Three Types.
- Class II. Protrusion of the Upper Teeth with Lower Normal—Five Types.
- Class III. Retrusion of the Lower Teeth with Upper Normal, and Upper Protruded—Four Types.
- Class IV. Retrusion of the Upper Teeth with Lower Normal, and Lower Protruded—Five Types.
- Class V. Bimaxillary Protrusion.
- Class VI. Bimaxillary Retrusion.
- Class VII. Open Bite Malocclusion.

THE CONSERVATION OF AN EXPOSED PULP

BY CARL O. ENGSTROM, D.D.S., SACRAMENTO, CAL.

ALTHOUGH cases of this kind do not belong in the writer's practice this direct treatment of the pulp may be of interest to some.

The case presented was that of a girl ten years of age. The upper left permanent incisor was minus part of the crown. This was due to an accident. There was a distinct exposure of the pulp in the region of the gingival third of the crown and a very thin layer of dentine covering the pulp near the incisal third. The redness of the pulp was in this latter part quite visible. The case was taken to a dentist and in his examination he put the point of an explorer into the exposed pulp causing a slight hemorrhage. The case was again presented to me. The saliva had bathed the tooth for several hours before I made my first treatment.

A band was made and cemented on the tooth for the protection and retention of treatments to be applied. The band was so made and placed that a clear view of the pulpal wall could be had. The cavity was then irrigated with warm, distilled water. A pellet of cotton moistened with one-half per cent chlorazene was placed in the cavity, and over this was placed a pellet of cotton containing sandarac varnish. The next day this treatment was repeated, and also the following day, except that cement was used in sealing instead of cotton and sandarac varnish. This last treatment was left in place for two days, and another applied. After four days another treatment was made and others followed with intermissions doubling each time. The vitality of the pulp was tested with the chip blower at each treatment. The pulp was not otherwise interfered with, and when sound dentine had been deposited, so that the red of the pulp could not be seen, at the same time revealing by test the vitality of the pulp, a layer of zinc oxide powder was applied and covered with zinc oxide cement.

Treatment was started February 17, 1919, and six months afterward the tooth was in good condition.

In about the first two irrigations of the cavity normal salt solution would doubtless be better. It will be noted that in this treatment there was very little interference with the pulp in its own reconstructive process. The inflammatory process which follows a wound of this nature was not enhanced as would naturally be the result when the symptoms of inflammation are contradicted by the ordinary pulp treatment. Conditions were clearly in view where changes could be noted from time to time. This is not possible where blind treatment is resorted to, such as ordinary pulp capping.

There is no question in the writer's mind but that many pulps are destroyed unnecessarily, which practice only leads to increased trouble later. Many pulps display greater vitality than is generally accorded them, reference being made to exposed and hypertrophied pulps of long standing. Surely other means, more scientific than the ordinary capping of pulps, deserve the earnest attention and study of the dental profession.

A LOCK FOR THE LINGUAL ARCH

By S. E. JOHNSTON, D.D.S., KANSAS CITY, MO.

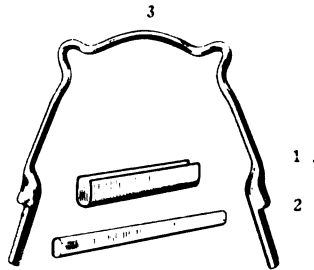
THIS clasp lock holds the arch securely in place and moves the anchor teeth bodily when expanding the arch.

The lock consists of two parts; Fig. 1, a clasp 8 mm. long, which grasps Fig. 2, a wire bar of the same length flattened on two sides, making it .040 by .056 inch. This wire bar forms the distal end of the lingual arch.

The clasp is soldered to the lingual side of the molar band parallel with the gingival margin of the gum and just free from it.

TECHNIC OF MAKING THE LOCK

From clasp gold plate .010 inch thick, cut a piece 8 mm. by 6 mm., partially bend with round pliers, forming the clasp lengthwise of the piece (Fig. 1). In the vise and with pliers, using a piece of the wire bar as a mandrel, shape the



4

clasp to fit it perfectly. File the jaws of the clasp almost flush with the wire it is to hold, then with the wire in place, grasp just the edges of the clasp in the vise and screw up until it springs out; this will give the clasp a strong grasp of the wire bar.

The clasps may be soldered to the bands on the model, or free hand. I prefer to place the bands on the teeth, take the impression, replace the bands in the impression, and line them with wax before pouring the model, so they can be removed and replaced on the model.

The clasps are soldered to the bands and these replaced on the model. The lingual arch is shaped to conform to all the teeth and the distal end cut square, just long enough to touch the mesial end of the clasp (Fig. 4).

A piece of the wire bar is cut 12 mm. long (Fig. 2) ; this is placed in the clasp, letting the mesial end extend out enough to make a good attachment to the lingual wire proper. With hard sticky wax fasten these ends together, carefully lift bands and arch from the model, slip the clasp from the bars distally, invest and solder the lingual wire to the wire bars. (Fig. 3.)

In finishing do not round the end of the lingual wire which forms the shoulder against the mesial end of the clasp. This shoulder holds the whole arch from moving distally. Fig. 4 shows the completed appliance on the model.

An aid in making these clasps is a mandrel made from a steel bar the same thickness as the wire bars (.040 inch) and a little wider than the clasp is long, rounded at one end.

After the clasp has been partially formed with pliers, using a lead block for a counterdie, the clasp is swaged with this mandrel, after which it is finished in the vise as above described.

SOME SUGGESTIONS FOR THE FORMATION OF A "LONDON ORTHODONTIC CENTER," TO WHICH WOULD BE ALLIED A "LONDON SCHOOL OF ORTHODONTICS," FOR POST-GRADUATE AND UNDER-GRADUATE WORK*

BY BERTRAM B. SAMUEL, L.D.S., LONDON, ENGLAND

THE writer, in his association over a period of ten years with various London Children's Hospitals and L.C.C. Dental Treatment Centers, has had his attention directed to the following points:

(a) The difficulty of obtaining the necessary orthodontic treatment for children other than those of the comparatively wealthy classes.

The existent dental hospitals have more of this type of work than they are able to undertake. It is realized that a great amount of treatment is also done by private practitioners without charge or for fees inadequate to the services given, but the majority of dental deformities go uncorrected.

(b) The want of appreciation of the fundamental principles of orthodontic science shown by the average dental practitioner, and his consequent lack of interest in what should be one of the most absorbingly interesting branches of dentistry.

It is suggested that in this matter the Capital of the British Empire should not lag behind Continental and American cities, and that a school should exist at which all the leading London orthodontists would be associated, where undergraduate and postgraduate classes would be given, and shortly, where the

*Read before British Society for the Study of Orthodontics, October 8th, 1919. Reprinted from *The Dental Record*, London, January, 1920, xl, No. 1.

vast amount of clinical material at our command here in London could usefully be employed.

The writer feels certain that there would be no lack of senior students and practitioners willing to pay a fee for the privilege of attending courses at such an institution, and the plethora of cases where treatment is desirable and desired is manifest to any who have had the opportunity of seeing large numbers of children of the artisan and industrial classes.

Provided that such a scheme had leading professional support, following on the appointment of a small committee (by, say, this Society), the subjoined steps could be taken to give it being.

Consideration of various methods to obtain financial support, such as—

(1) Appeal to the public through the press.

(2) Private appeal to wealthy individuals.

(3) Address to Ministry of Health.

(4) Request to L.C.C. asking for capitation grant for L.C.C. scholars attending.

There are, of course, many other points that it is needless to elaborate at this stage, but granted that his premises are accepted by the profession, the writer is of opinion that none of the difficulties are insuperable, and that such an institution would be of immense service to the profession and directly and indirectly to the public.

DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

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AN ANALYSIS OF GUNSHOT INJURIES TO THE FACE

BY V. H. KAZANJIAN, C.M.G., D.M.D., BOSTON, MASS.

Demonstrator of Prosthetic Dentistry, Harvard University Dental School

THE great majority of gunshot wounds, except superficial cuts and abrasions, are inevitably associated with the facial bones, because of the thinness of the facial musculature and of the large amount of osseous substructure. Though the damage be but slight, a communication may have been effected with the nasal or the oral cavity, the antra, sinuses, or pharynx. The amount of injury as a result of gunshot wound, which the soft or hard tissues suffer beyond the entrance wound, is in the first instance the result of the speed, shape, and striking angle of the piece of metal, and in the second instance the result of the bony fragments which act as secondary projectiles, with almost explosive violence. These forces may cause a large path and an extensive wound of exit in the tissues; yet the actual destruction or complete tearing away of substance is usually not present to any marked degree, and the severed borders of the wound may be traced. The exaggerated size of the wound is due to the contraction of the severed muscles toward their origins and insertions, to the local inflammation, and to the weight of the shattered pieces of bone. A large number of facial wounds are seen with a small entrance and a small exit. The severity of such wounds depends almost entirely upon the anatomic location and the path of the piece of metal. Through-and-through wounds of the anterior part of the face may cause extensive destruction of the teeth and comminution of the bone, but in the main do not lead to alarming complications provided adequate treatment at an early period is effected. Contrary to this, however, wounds involving the posterior part of the face, especially those of the pharyngeal, carotid, and lower molar regions, are particularly dangerous. Such injuries may cause bilateral fracture of the mandible, and in many cases may be situated near enough to important blood vessels to insure a probable chance of severe hemorrhage.

The tongue, since it occupies almost the entire oral cavity when the mouth is closed, is liable to serious injury along with either the upper or the lower lip. If the wound be limited to its apex or dorsum, its abundant blood supply promotes rapid healing in spite of severe laceration or even sloughing; but, if it be penetrated about its base, serious hemorrhage may ensue through involvement of lingual arteries. Fragments of bone and teeth are apt to bring complicating factors, if driven into the tongue: they convey infections and elude detection and localization by radiogram (Fig. 1).

WOUNDS OF THE LOWER PART OF THE FACE

A wound of the lower lip represents a fairly common type of wound in connection with which there exists a small wound of entrance, at first obscurely marked at different points posteriorly, on the neck, cheek or face, leading to symphysis (Fig. 2). The lip may appear lacerated with appreciable loss of tissue, or may



Fig. 1.



Fig. 2.

partially or entirely destroyed with attending comminution and destruction of the mandible at the symphysis. Other fractures of the jaw may occur as the result of transmitted force.

There are seen hideous, gaping wounds of the lower lip, chin, and even the sublingual region, which communicate with the oral cavity and which are accompanied by severe injury to the bone: but in many instances these are but tensile tears in the soft tissue, do not involve a loss of substance, and consequently lend themselves favorably to suturing at the proper stage in the treatment of the case (Fig. 3).

There also occurs a type of wound less commonly which is serious and tensile, involving laceration and destruction of the lower lip, chin, sublingual region, and even the upper aspect of the neck. These have a characteristic appearance and require special consideration since in addition to the mutilation of the soft tissues there usually occurs serious loss of the mandible (Fig. 4).

WOUNDS OF THE UPPER PART OF THE FACE

Injury of the upper lip is quite commonly seen and varies in extent from laceration and slight loss of tissue to a complete destruction involving the lower part of the nose.



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.

The more serious wounds of the upper part of the face may include a part or the whole of the nose, the eyes, the ears, and the zygomatic region. The maxilla is apt to suffer great comminution and considerable loss of bone in case

of injury of this type. The loss of the upper lip is invariably associated with mutilation of the anterior part of the maxilla, at times as far posteriorly as the



Fig. 7.



Fig. 8.



Fig. 9.



Fig. 10.

molar regions, and in some rarer instances practically the entire maxilla, and the septum of the nose may be carried away. The involvement of one or both antra is common, and might almost be said to be a certainty (Figs. 5, 6, 7 and 8).

A lacerating wound of the cheek, if at all severe, communicates with the oral cavity and in many instances is sufficiently extensive to involve the angle of the mouth, the lips, the eye, the ear, and the lateral aspect of the neck. Usually there is free exposure of the bony substructure, mandible, maxilla, and zygomatic process (Fig. 9).

Wounds high on the cheek, if anything more than an abrasion, are practically certain to involve the ascending ramus of the mandible, the temporomaxillary articulation, and the parotid gland, and furthermore obviously give rise to paralysis of the side of the face which is injured. In the extreme instances the injury includes the mastoid region and the base of the skull (Fig. 10).

EFFECT OF FACIAL WOUNDS

The high degree of vascularity of the face gives opportunity for free primary hemorrhage following gunshot wound. The wounds become inflamed and speedily septic because of the presence of organisms in the nasal and oral passages.

In the event of gunshot wound of the face and jaw the patient undergoes considerable pain and physical and mental reaction; and furthermore suffers great inconvenience through the impairment of the most natural of functions; chewing, swallowing, breathing, speaking and the retaining of saliva. In spite of the peculiar disadvantages which accompany the wound, however, favorable progress toward recovery is made (1) because of the rich blood supply to the parts affected (2) because of the free flow of saliva which, though teeming with organisms, nevertheless maintains a slow and persistent mechanical irrigation of the wound and prevents the tissues from becoming dried and encrusted with blood, pus, and food particles, and (3) because of the opportunity for drainage to the nasal or oral cavity independently, if necessary, of the usual external drainage.

FIXATION OF THE BONY PARTS

In order to discuss clearly the question of splints and appliances used in the treatment of wounds of the face and jaw, an analysis of the nature of the bony injury is necessary, as compared to the maxillary fractures seen in civilian life. This latter type, usually the result of a fall, a blow, an accident, kick, and so on, and usually referred to in discussion as "accidental" without definite regard to their cause, is serious at times and may be compound, but is free from actual bony destruction except in the instances when teeth and their surrounding alveolar process are knocked loose. The lines of fracture are irregular, but well defined, and the displacement is less pronounced than in the case of war injuries. The healing process is as a rule more rapid and uneventful, though at times it is difficult to reduce the displacement properly, because of the fact that the irregular ends at the site of fracture, being but slightly comminuted, have a tendency to interlock. The patient suffers considerable pain and inconvenience, and mild complications such as localized inflammation and abscess; but beyond these the more serious complications do not usually occur except in the event of inadequate or delayed treatment.

But when the fracture of the jaw is the result caused by a bullet or other weapon of warfare, comminution and a definite, though perhaps slight, destruction

of bony tissues exists. Such injury may be confined to the teeth and alveolar ridges and not seriously or materially impair the continuity of the bone, while in other instances a large portion or the whole of the upper or the body of the lower jaw is blown away. In extreme cases it is often found that the injury has included the whole of the nose, the tongue, the sublingual region, or the entire lower part of the face.

The site of fracture following gunshot wound is not characterized, as is true in accidental cases, by an irregular line, but by multiple lines of fracture which radiate in many directions. The mobility of the parts is freer, and there is little or no tendency on the part of the segments to interlock rigidly. The pronounced mobility and displacement of the segments of bone is increased by the extensive laceration of the overlying soft tissues.

In the majority of cases the likelihood of grave complications confronts the attending surgeon. And in addition to the suffering caused by wounds of the face and jaw, as described, and the anxiety of the possibility of serious complications, it is the rule rather than the exception that the fortune of modern war made the patient the recipient of wounds of other parts of the body, wounds which need a separate scheme of treatment and which give rise to different symptoms and discomforts.

COMPARISON OF IMMEDIATE AND GRADUAL IMMOBILIZATION

During the period of the war many advances were made toward the perfection of the appliances used in the treatment of maxillary fractures, and many extremely ingenious devices were offered to the profession. To the casual observer there might appear to exist a complexity and confusion of appliances; but most of them in one way or another have served a purpose. All fall into two distinct classes, according to the intended object in their adaptation: (1) appliances and splints designed for the immediate fixation of the fragments, and (2) appliances and splints constructed to cause gradual reduction of bony displacement and deformity.

As previously described, the wound in the first days following injury is inflamed and septic, and the bony tissue after fracture is in extreme displacement, and mobile and poorly supported. At this stage it is important to note that a rigidity of the tissues brought on by contraction and scar formation has not yet occurred. As the sepsis and inflammation subside, so healing begins and sequestra are exfoliated, and the bone either consolidates to some extent or becomes firmer in a deformed position in the soft tissues.

Immediately, or soon after the time of fracture, the segments respond easily to manipulation, and the reduction of displacement is possible with the fragments maintained in correct position and alignment by comparatively simple splints; but if the immobilization of the bony parts is left until that later period when the fragments resist reduction because of the fact that healing has begun, then it is obvious that splints and appliances of a more complicated construction are needed.

It has been proved beyond doubt that the former method—namely, that of immediate or early fixation of the bony parts—is preferable, even though the

days just after injury are critical for the patient. So far the advantage of early fixation has been emphasized only from the mechanical viewpoint; but it is of equal importance to note that the immobilization of the bone and the reduction of the fracture have lessened the size of the wound and consequently diminished the irritation and inflammation of the soft tissues, and that there has been utilized that brief period of time in the progress of a case which precedes the onset of serious complications, should any occur which would prohibit work incident to the adaptation of splints. The patient is also rendered more comfortable, and is happier because he feels that something has been done to set him on the road to recovery.

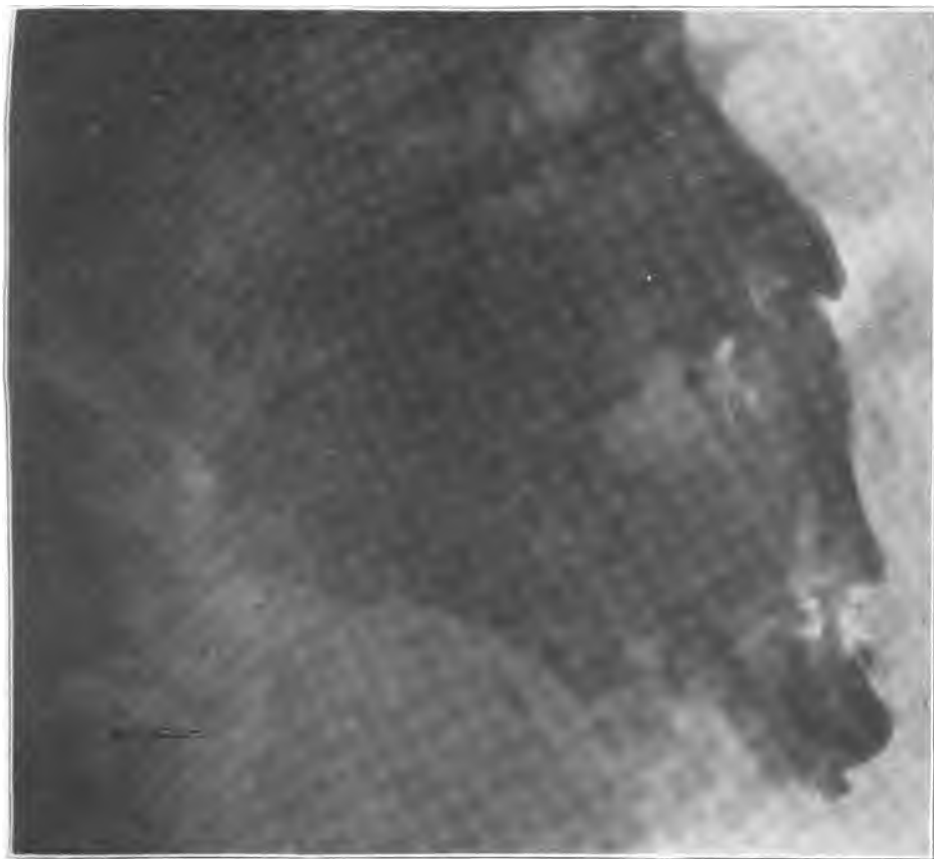


Fig. 11.

In order to carry out a successful technic for the immediate fixation of the bony tissues, the following requirements are essential:

1. The procedure adopted must be sufficiently simple to make possible the treatment of a large number of cases. The dental mechanics attached to the department must have the facilities to make a large number of appliances easily, rapidly, and accurately, and also must have in a partial state of completion such appliances as headgears, metal bands for the teeth, etc. Promptness in the construction of splints is an essential factor in a scheme for immediate fixation.

2. The actual adjustment of the completed appliance must be sufficiently simplified to cause the minimum amount of pain to the patient. In view of the general condition of the wounded man, it is often advisable or necessary that minor operations, impression-taking, and other details incident to the construction of appliances be done at the bedside. For any step in the preparation and adjustment of the splint there is never justification for the use of a general anesthetic.

Private B was wounded on June 10, 1917, and admitted to the hospital on June 12, 1917.

There was a large lacerating wound of the lower part of the face extending from the right corner of the mouth to the submental region (Fig. 3). The mandible was severely comminuted, from the mental to the first molar region, with marked downward and inward displacement of fragments (Fig. 11), es-



Fig. 12.

pecially at the site of the external wound. There was great laceration and inflammation of the oral mucous membrane. In addition, the patient was suffering from a wound on the right shoulder and on the left leg.

The general condition of the patient was fair. He was coughing quite freely and the temperature fluctuated up to 100° for a few days. Otherwise he was quite comfortable.

On June 17, the mouth was cleaned surgically by removing some sloughed and necrotic tissue, useless and loose teeth, and pieces of bone. There remained in the mouth two sound molars on each side of the jaw. Over those molars a band and arch splint was secured, giving anatomic relations of the remaining parts of the mandible. A vulcanite removable appliance was fitted to the arch of the splint, to give proper labial fullness and to prevent adhesion to the alveolar process during the process of healing.

On June 27, the wound was fairly clean, the edema and inflammation having disappeared (Fig. 12). The soft tissues were sutured.

The operation was performed under novocaine anesthesia.

1. The borders of the wound were excised.

2. The borders of the mucous membrane were approximated and sutured with catgut.

3. The borders of the skin could not be brought together on account of greater laceration of the external surface of the wound, and therefore a skin flap was turned from the right side of the face to cover the gap. (See Fig. 13.) A small drainage tube was inserted at the base of the wound.

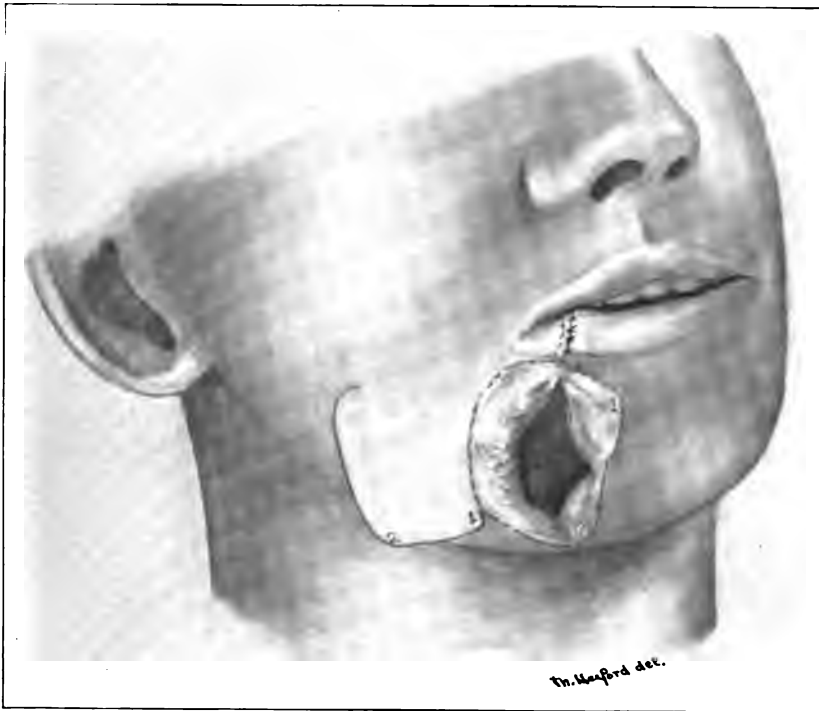


Fig. 13.

On October 17 and 19 it was necessary to open abscesses in the sublingual region, which were attributable to small sequestra of bone still to be exfoliated or removed by operation.

An x-ray picture showed that the lower right first molar was sufficiently involved in the region of fracture to hinder progress. This tooth was removed and a new splint of the same type as the former was cemented to place.

On November 1 the scar left by the drainage tube at the lower border of the wound was removed.

On November 19 the patient was transferred to England. All suppuration had ceased, the scars were very slight, and bony union was progressing in a satisfactory manner (Fig. 14).

Skipper Private S was wounded on July 31, 1917, and admitted to hospital on August 2, 1917. There was a large lacerating wound extending from the left angle of the mouth to the angle of the mandible. The left side of the



Fig. 14.



Fig. 15.



Fig. 16.

tongue was injured and inflamed, and attended with partial paralysis due to involvement of the hypoglossal nerve (Fig. 9).

The mandible from the left cuspid to the ascending ramus was comminuted,

with free exposure of the resulting fragments of bone and downward displacement. All the teeth of the right side of the upper jaw were destroyed. On August 8 a cap splint was cemented to the teeth of the lower right side, with an arch wire extending over the injured area of the left side. To the latter four fragments were suspended by fine wire sutures. An upper cap splint was cemented to the remaining sound teeth of the maxilla, and the lower jaw was thus immobilized by intermaxillary ligation between the two splints. On August 13



Fig. 17.



Fig. 18.

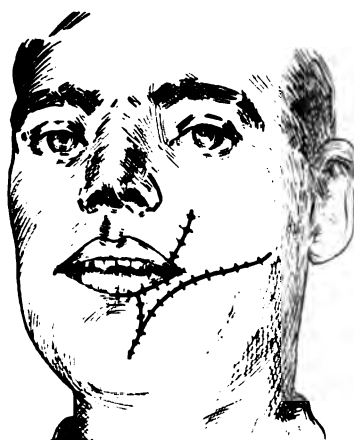


Fig. 19.

the wound of the face was partially sutured (Fig. 15), leaving the part near the corner of the mouth to granulate because of a distinct loss of tissue at that point.

Fig. 16 shows the condition of the patient on September 3, when a second operation was performed. The scar on the face was removed, and the missing portion at the left angle of the mouth was supplied with a small rectangular flap taken from the left side of the upper lip. The red border of the lower lip was freed and stretched to cover the raw surface of this flap (Fig. 17, 18 and 19).

On October 29 a small operation was necessary, to make further improvements in the left corner of the mouth. One of the larger fragments of the jaw which was suspended to the splint was exfoliated, and from time to time other small sequestra came away; but at the time of dismissal of the patient, Janu-



Fig. 20.



Fig. 21.



Fig. 22.



Fig. 23.

ary 10, 1918, there was a healthy bony growth of the mandible except for a space of about one-half inch at the angle, where fibrous tissue existed. The remaining teeth on the right side were in good occlusion with the upper teeth, and the facial scars were rapidly disappearing. The final condition before dismissal is shown in Fig. 20.

Private M received wounds of the face and shoulder on September 15, 1916, and was admitted to hospital on September 18. The upper lip was almost completely destroyed, and the right cheek and right portion of the lower lip were lacerated (Fig. 5).

The maxilla was comminuted with loss of tissue anterior to the molar regions, with accompanying destruction of the floor of the right antrum. The lower jaw was intact.

In accordance with the general treatment of the case, minor operations were necessary to remove sloughing tissue and to remove useless and loose teeth and particles of bone. A few stitches were inserted to support the mucous membrane, and a rubber tube was used to drain the region of the right antrum.

A few days after the patient was admitted to the hospital, a vulcanite splint attached by clasps to the molar teeth was used to mould the maxillary tissue



Fig. 24.



Fig. 25.

and to preserve the contour of the remaining buccal and labial tissues. This vulcanite plate, or splint, is essential to the repairing of the tissues, and is worn very early in the treatment even if it comes in contact with raw surfaces.

On October 17 the inflammation of the face had subsided sufficiently to allow suturing of the buccal portion of the wound with local anesthesia. The rules adopted for suturing are as follows: If the soft tissues are lacerated, but suffer no destruction, then the borders are approximated and sutured as soon as inflammation has been reduced. But, if there is a loss of soft tissue, only radiating portions of a wound respond to early suturing, while closure of the wound as a whole is postponed until suppuration, inflammation and contraction have ceased. In addition, the general condition of the patient must be satisfactory at the time of operation.

In this case recorded the radiating portions of the wound were sutured early in the treatment, and on January 9, 1917, under local anesthesia, rectangular flaps

were taken from the upper part of the face (see Figs. 21, 22 and 23) to form the upper lips, and thus finally close the wound. On February 2 the border of the upper lip was trimmed to make it shorter, and the margin of the mucous membrane was improved. At the same time the lower lip was shortened, to procure harmony with the upper lip, by removing a small triangular piece at the median line. The patient was supplied with an upper denture and evacuated to England on March 15, 1917 (Figs. 24 and 25).

DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Under the Editorial Supervision of

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It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

NOTES ON INTERPRETATION OF RADIOGRAMS*

BY B. FRANK GRAY, D.D.S., SAN FRANCISCO, CAL.

RADIOGRAMS are quite commonly regarded as a record of shadows on the photographic film or plate. It is just as well, however, to analyze this conception just a little bit. An ordinary shadow is cast when an object is interposed between the source of light and the screen or field beyond the object. Usually the light does not pass through the object at all. However, in the case of the shadow of a cloud on the hillside, the sunlight, of course, does penetrate the cloud to a greater or lesser degree, and it may be noted particularly that the greater the light penetration in this instance the weaker the shadow.

In the radiogram we are much interested in light penetration. Indeed the picture is wholly dependent on the degree to which the x-rays penetrate the object interposed between the tube and the sensitive film. In the illustration of the shadow of the cloud, the greater the light penetration the weaker the shadow: in the radiogram the greater the penetration of the x-ray, the deeper the shadow. So I may leave it to you as to how analogous is the shadow in the one instance to that in the other.

Therefore the tone of a radiogram, whether dark or light, black or white, depends upon the resistance of the tissues through which the x-rays pass. Of course we assume a proper technic is observed, since a faulty method might result in having all tissues appear dark—or as deep shadows. On the other hand, an improper technic may make all tissues appear light in the radiogram. Thus, there would be no proper differentiation.

Let us assume a normal maxillary bone. We may lay back the soft tissues over the apex of a cuspid tooth. Then we shall remove the bony tissue at the immediate apex of the tooth to the extent of the size of an ordinary rifle bullet. We again put in place the thin outer layer of bone, and stitch the soft tissues

*Dr. Gray and Dr. Carter were invited to give instruction in Dental Radiography to a number of the members of the California State Dental Association last June. The "Notes on Interpretation" are here presented in the belief they may be of interest to some of our readers.—Editor.

up. A carefully made radiogram may reveal an area at the apex of this tooth very dark indeed. This so-called area is not due to any pathologic process at all. It is merely due to the mechanical or surgical removal of a certain portion of bone, and thus the resistance to the penetration of the x-rays is lessened. The worst sort of streptococcic infection—the most clearly defined “granuloma” might look no more dangerous than the radiogram we secure from such an experiment.

Unless we keep the rationale, i. e., the photography, the physics and the technic of the work in mind, we have no proper basis of interpretation. We may find ourselves reading disease—pathology—into practically every radiogram that we observe.

Have you seen in certain radiograms of teeth very decidedly dark lines following the outline of the tooth in its socket? Did it ever occur to you these dark lines represented pathologic conditions? They might—but the chances are they do not. But I know a prominent surgeon who insisted this was the case and this gentleman was one of the first in his community to make radiograms of teeth. He did not seem to appreciate that the investing membrane of the tooth and alveolus might permit of a relatively more rapid passage of the x-rays at that immediate point than elsewhere, and still the resultant picture would have no pathologic significance.

In the mouth where a tooth has been a long time missing, a radiogram of that immediate portion of the jaw may record a very dark area. It does not necessarily mean pathology at all, but only denotes the alveolar process or the true bone is either thin or osteoporous, permitting of the rapid passage of the rays at that point.

Beyond doubt the most difficult teeth to picture radiographically are the maxillary molars and premolars. This is due to the misleading and trouble-making maxillary sinus—also to the malar process, and further to the difficulty with which a film may be properly placed and held at this location. Because of the angle at which the rays must be directed for radiograms of the upper molars, the maxillary sinus is interposed between the tube and the film. The result is large enclosed dark areas about the roots of the molars and bicuspid. Some very intelligent dentists, even having had a year or two of experience in observing radiograms, have said “It looks like that tooth goes into the antrum.” Well, I do not know that I ever saw a radiogram that showed conclusively that any tooth root penetrated the antrum, and I should like to see some of them. Doubtless some teeth do penetrate the antrum, but the difficulty is to tell from a radiogram whether they do or do not. There are doubtless more than 99 chances out of a hundred they do not. From necessity one must place the tube so high that the rays pass through the antrum before they reach the roots of the molars—with a resultant picture of these roots in such relation to the antral shadows that a novice may suspect they actually penetrate the antrum. Maybe stereoscopic radiography may assist the profession in this immediate problem, as by that method it is aimed to establish a real perspective in the radiogram, such as is not contemplated at all in the ordinary flat picture with which we are all more or less familiar.

We must learn to know what these antral shadows look like, and we must learn to make exposures at different angles, so as to eliminate these shadows as much as possible from the field we wish to critically observe—for instance about the apices of the roots of molars and bicuspids. Naturally enough the great variation in size and location of the maxillary sinuses has much to do with our problems. And again, we need to differentiate *between* shadows or so-called “areas.” Thus we may detect significant records or shadows *within* these antral shadows.

Speaking of “areas” I believe the thought is quite general that a small “area” at the apex of a root signifies a relatively harmless condition, while a large “area”—as black as your hat—is sufficient cause for a major surgical operation within twenty-four hours. Now if we forget our bacteriologic studies, that way of thinking may do very well, but once we recall that a family of several million members can get on comfortably in quarters possibly no larger than half a pinhead in extent, then I think we shall have little ground for feeling so sure as to the small “areas.”

And what about those so-called “dead teeth” that show no areas at all? Well, they may be just as bad as any of the others. In fact they may be far more insidious—as they do not invite very much suspicion. There is no guarantee whatever that such a tooth has no pathologic significance. I recall a case in point. A prominent oculist wished radiograms of the teeth of a patient suffering from a severe form of iritis. The maxillary lateral incisors, while nonvital, were fairly well filled, and showed no rarefied areas at apices. However, because of the urgency of the case, the family dentist opened up one of the teeth in question, and to the surprise of everybody a very considerable flow of pus was noted. Shortly afterward I received word the eye trouble was rapidly lessening.

Now there is another consideration I want you to get clearly in mind. Recall, please, the worst appearing “area” at the apex of a tooth that you can. Let us assume the tooth lost its pulp January 1 in the year 1900. A certain infective process started at once, although the pulp canal was pretty well filled, etc. Do you think a radiogram made March 1, 1900, would have revealed an “area?” Not necessarily. Would it have done so on July 1? Not necessarily. Certainly until *degeneration* of those tissues occurred, allowing of a lessened degree of penetration to the x-rays, you would have obtained no significant showing. I do not know just how long it takes to break down the tissues through these infective processes. I am an orthodontist and that takes up my time. If you can get clear-cut information on this subject it will be helpful. But the point is, how many radiograms do we make of nonvital teeth—well-filled canals—get a negative showing, and conclude all is well? And all the while there may be the most serious kind of an infection under way.

I take it many of you are going to maintain a conservative attitude relative to so-called dead teeth. Some of you are already convinced—or will be convinced—there is no half-way ground: and you are like the prominent physician in Colorado who says “There is no such thing as a good dead tooth.” But while you are still maintaining your conservative attitude I feel the best possible advice I could give would be that you at least familiarize yourself with the con-

siderations I have just mentioned, and that you consider well the health and resistance of your patient. It would seem to me in the case of two patients, the first infirm and sickly, the other in robust health, that nonvital teeth (negative radiographic showing) in the first instance might be regarded as a possible serious menace, while in the latter instance similar teeth might not cause you to go to the same length of operative procedure.

If you will interest yourself enough in radiography to learn its technic—to learn somewhat of its photographic processes—you will presently find as much fascination in it as you might in any other hobby, and I assure you it may prove to be a very useful one. Do not delegate this work to your assistant. At least not until you have mastered it yourself.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

A Case of Isolated Division of the Great Hypoglossal Nerve. A. Barbe. Le Progres Medical, 1919, No. 38, p. 377.

In the case of a soldier who was wounded by a bullet in July of 1917, the course of the projectile could be reconstructed as follows: It entered the mouth, on the left side, at a moment when the mouth was open, passed through the buccal floor, causing a fracture of the angle and ascending maxillary ramus, inflicted a wound of the neck, exposing the carotid vessels, and passed then through the upper portion of the shoulder, fracturing the acromion. When the patient was examined thirteen months later, he presented no deviation of the mouth when this was at rest, but when he opened the mouth, it became slightly deviated downwards and to the right, assuming an oblique oral shape. The tongue was affected by a complete left-sided hemiatrophy, resulting in disturbances of speech with stammering; the patient was unable to protrude the tongue forwards, to draw it backwards, to draw it to the left side, to contract it towards the middle line, to raise it towards the velum of the palate, to roll it up, or to spread it out. The site of the wound and the existing motor disturbances justified the conclusion that the nerve had been divided at the point where after descending it becomes horizontal, so that its descending branch was not involved; on the other hand, the branches of the hyoglossus, styloglossus and geniohyoid muscles were apparently affected, and this opinion was confirmed by the electro-diagnostic findings. Sensation was normal in all its forms over the lingual mucosa. The tongue presented a wrinkled and puckered appearance, due to the underlying muscular atrophy; the masseter reflex was strong and lively. Electrical tests showed a very evident reaction of degeneration of the muscles innervated by the terminal branches of the nerve; the contraction of the geniohyoid was somewhat weakened. This case is noteworthy, for it constitutes a valuable laboratory experiment, plainly demonstrating that the great hypoglossal is an exclusively motor nerve. Isolated divisions of the twelfth pair are moreover extremely rare. According to Piersol, the motor fibers of the tongue are supplied by the hypoglossal, aided probably by the facial through the chorda tympani. Those of common sensation are from the lingual branch of the fifth for the anterior two-thirds and from the glossopharyngeal for the remainder, except the region just in front of the epiglottis, which is supplied by the

superior laryngeal from the vagus. The glossopharyngeal area somewhat overlaps the posterior third, as it supplies the circumvallate and foliate papillæ. The chief fibers of special sense are derived from the glossopharyngeal, their principal distribution being to the taste buds on the circumvallate papillæ.

Surgical Treatment of Gunshot Injuries of the Mandible and Its Surroundings. H. Joseph. *Archiv für klinische Chirurgie*, 1919, iii, No. 4, p. 995.

Gunshot injuries of the face, the neck, and the bony framework of the face, including simple perforations through infantry projectiles as well as extensive destruction of soft parts and bones through fragments of explosives, require for their proper treatment the cooperation of surgeons and dentists. The treatment of these lesions must aim at a twofold object, first, the repair of damaged soft parts; second, the fixation of bones the continuity of which has been destroyed. Upon the basis of personal experience in war hospitals devoted to this class of injuries, the author recommends autoplasmic procedures in defects of the lower jaw and in pseudarthroses, as a reliable method without technical difficulties. The results, under aseptic conditions, are very favorable, as illustrated by the following figures: Of 52 cases of bone transplantation on the lower jaw, 34 healed with complete bony union, meaning that the site of implantation is absolutely solid, after several months' observation, following the definite removal of all dental dressings. Five cases proved unsuccessful, the graft being expelled under suppuration, or requiring removal. In four cases, one end of the graft became firmly united to the corresponding fracture end, while a pseudarthrosis originated secondarily at the other end; in such cases, an attempt is in order to remove the secondary pseudarthrosis by means of a repeated transplantation. Complete solidification may be anticipated in a reasonable period of time, in a number of other cases, so that the number of cures may be stated as 41 to 52, namely, almost 79 per cent.

The time required for healing after transplantations of bone varies greatly, irrespective of the size of the bridged bony defect. As shown by an investigation of the 34 completely healed cases, the shortest periods required for solidification were twelve to eighteen months in defects from 1 to 6 cm. in length. Two cases of pseudarthrosis, between which bone grafts of one and two cm. in length, respectively, were inserted, required the longest time for solidification, namely, fourteen and eighteen months. Individual differences of ossification and general nutrition are presumably of decisive importance in this respect, aside from the operative technic. The clinical material did not permit the demonstration of the length of healing being dependent upon the location of the fracture in the body or the ramus of the maxilla, or its position within or outside of the tier of teeth. The latest perfectly consolidated transplantations from the pelvis showed a certain regularity in the time required for healing, of about three to four months.

The complete solidification and clinical healing of the site of transplantation is by no means combined with an anatomically unobjectionable re-establishment in continuity of the bone. Absorptive and reconstructive processes are continued for a long time after the graft is healed in and solidified, so that the x-ray picture

after clinical consolidation usually still presents essential structural discrepancies between the graft and the fracture ends. It is not until all differences between the damaged maxillary region and the fragments have become anatomically compensated, as shown by the radiogram, that we are justified in assuming the complete regeneration of the destroyed portions of the bone, constituting a cure in the true sense of the term.

The material serving for the grafts, in the first 23 cases, was a periosteum and bone segment from the anterior edge of the patient's tibia; but as it appeared more advisable, in the interest of more rapid healing, to utilize a graft from a bone rich in bone marrow, the piece destined for implantation was taken from the iliac crest, in the second series of 32 cases. All the operations on the jaw, as well as for the removal of the bone segment, were performed under local anesthesia, like the plastic work on the soft parts; usually combined with interruption of nervous continuity in the mandibular nerve at the foramen ovale.

On Cancer of the Tongue. D. A. Power. Medical Press, 1919, cvii, p. 23.

In his report on cancer of the tongue, Power calls attention to the fact that it is almost entirely a human disease, unknown in children, common in men, and rare in women. Some of the factors which enter into the cause of this disease are irritations from various teeth.

He reports that an examination of the records at St. Bartholomew's Hospital showed that 169 persons were admitted with cancer of the tongue during 1909-1916. Nine of the patients were women and 160 were men. The proportion of men to women being 18 to one—the true proportion as shown by the Registrar-General's returns being one woman to eight men. Seven of the women were married, one was unmarried, and the social state of the other is not mentioned. Of the 7 married, one gave a history of syphilis, 2 showed evidence of syphilis, and one was a widow who had only one child alive out of five, the note adding "she looked as though she drank." None of the women smoked but all had bad teeth.

In the case of the men, 93 out of the 160 were syphilitic; 62 gave a history of syphilis. Many of the patients had drunk beer to excess, but did not as a rule acknowledge readily that they had taken spirits freely.

As cancer occurs sometimes in the domesticated animals, syphilis can not be considered as more than a disposing cause, and some exciting cause must be looked for which has become prevalent recently. The increased consumption of tobacco seems to be such a cause. Smoking in public has increased steadily from 1877, until it is now well-nigh universal among men, women, and boys. It is possible, therefore, that smoking is important in the increasing mortality from cancer of the tongue. The irritant acts in two ways locally, for it is partly due to the nicotine and partly to the heat, and it is well known from kangri cancer that thermal irritation is a factor in the production of epithelioma. The actual cause of cancer is still undiscovered, but if the main factors are known it should not be impossible to discover its nature.

Fistula of the Parotid in War Wounds of the Face and Jaw. P. P. Coe.
Lancet, London, 1919, i, p. 971.

The rarity of this complication of facial wounds is illustrated by the small number of cases (16) which came under the author's care during a period of nearly four years. These fistulae may affect the parotid gland on its duct, the former being incomplete or complete. The differentiation of incomplete fistula of the duct from fistula of the gland is difficult, and the diagnosis is sometimes a mere probability based on the position of the fistula. In the rare cases where healing is delayed, the application of radium or x-rays is indicated, to which gland fistulae and incomplete fistulae of the duct always reacted favorably in the author's experience. Complete fistula of the duct is incurable except by operative methods, preferably in the form of reparative procedures in which the mouth cavity is made to reach the duct. In two cases operated upon by the author with highly satisfactory results, a curved incision was made with convexity down and a small flap reflected upwards. This displayed the duct, the distal end of which was ill defined and buried in scar tissue. A small lateral hole in the duct marked the limit of potency. The duct was then freed, its terminal portion resected, and two very fine catgut traction sutures were passed through its walls. The mucous membrane covered by buccinator was then made prominent immediately in front of the masseter by means of a small swab pressed against it from inside the mouth, and a small longitudinal incision was made through it into the mouth. The masseter was nicked at its anterior border and the margins of mucous membrane were stitched to the deeper margins of the wound. Through the aperture thus created the stay sutures were passed and the duct was gently pulled into the funnel-shaped extension of the oral cavity. The duct was buried in the extension and the extension cut off from communication with the exterior by catgut suture. The skin wound was then sewed up, drainage being established through a small stab incision. Each stay suture through the duct was then made to take a good hold of mucous membrane inside the mouth, so that when tied the duct was secured in place. In both cases slight suppuration with a discharge of saliva occurred about the tenth day. Communication with the mouth had, however, been well and visibly established and firm healing occurred in a few days. Both cases were kept under observation for three weeks and were then discharged as cured.

Displacement of the Mandibular Meniscus and Its Treatment. J. Pringle, *British Journal of Surgery*, 1919, vi, p. 385.

As in the knee-joint, so in the mandibular articulation, displacement of the meniscus is the result of some sudden movement.

Contrary to the usual description of the mandibular meniscus, the author has invariably found that there is a very decided central thickening of the disc in its coronal plane over the summit of the condyle. In front of this ridge there is a distinct depression in the disc which fits the tuberculum articulare of the temporal bone, while below and anterior to it there is a second thickening which forms the anterior border of the disc and in its lower part the insertion of the external pterygoid muscle. The author believes it is due to overaction or irregular action on the part of the external pterygoid muscle that the disc gets dragged out of its normal position.

After displacement the disc acts as a foreign body in the joint; either it gets caught between the rolling condyle and the tuberculum articulare or continues to move with the condyle but in flexion can not clear the articular eminence.

Pain, difficult mastication, and a definite feeling of obstruction in the joint preventing complete flexion are the main symptoms.

Reduction may be accomplished by keeping up hard pressure at the back of the condyle with the mouth open and slowly closing the jaw. In some cases this process must be repeated several times. The moment it succeeds, the sensation of the presence of a foreign body in the point disappears at once. In recurring cases the only method of treatment is operation.

In 1887 Annandale recorded two operative cases in which he sutured the loose disc to the periosteum. In 1911, the author removed the left disc in a young woman suffering from frequent recurrence and obtained a very good result.

Toxic Necrosis of the Maxilla Following Antiluetic Treatment. W. Schulze. Mitteilungen aus den Grenzgebieten der Medizin und Chirurgie, Jena, 1918-19, xxx, p. 366.

The author arrives at the conclusion, on the basis of personal experience with five cases of toxic necrosis of the jaws recently treated in the Halle University Clinics, that these complications do not occur as a result of salvarsan treatment, which, on the contrary, will actually cure cases of ulcerative stomatitis (Plaut-Vincent) of the mucosa of the cheeks. In the presence of mercurial stomatitis, no further damage is done by simultaneous salvarsan treatment, but salvarsan is actually of great therapeutic value in certain cases of mercurial stomatitis. Gray oil, and mercinol, are dangerous preparations, which can not be sufficiently warned against. The prognosis as to life is not always favorable, as in the cases under the author's observation. In some patients who were admitted to Lesser's polyclinic, suffering from intoxication due to mercinol treatment, the stomatitis became rapidly associated with severe disturbances on the part of the digestive, uropoietic, and nervous systems, which in a short time led to death. Mercinol is a very dangerous remedy in the hands of others than experienced specialists. The proportion of the curative dose as compared to the fatal dose is 1:30. Accordingly, extreme caution is indicated in the employment of this remedy, taking into consideration all factors contraindicating its use in a given case.

The first of the author's five observations concerned an artificial necrosis of the jaw in a girl of twelve years, as a result of faulty treatment of a tooth on the part of a dentist with acidum arsenicosum, the employment of which in dentistry can not be sufficiently cautioned against. Cases of maxillary necrosis due to the local action of arsenic are not of frequent occurrence, aside from dental practice. In the second patient, a young man with sequestration of two alveoli in the left upper jaw, a mercurial necrosis developed as a result of combined iodide and mercury treatment. The third patient, a man of 27 years, had purulent stomatitis, followed by necrosis of the jaw, towards the end of anti-syphilitic after-treatment, during which he received besides salvarsan, four injections of mercinol in the course of four weeks, the maximum dose of the

remedy being administered each time. Salvarsan had been readily tolerated during a combined mercury and salvarsan cure, half a year previously, and is therefore not to be held responsible for this maxillary necrosis. The fourth patient, a woman 25 years of age, was attacked at the end of a six weeks' course of neosalvarsan and mercury treatment by stomatitis which finally led to necrosis of the entire alveolar process of the lower jaw. The condition in this case presented a remarkable resemblance to phosphorus necrosis. In the last patient, a woman 27 years of age, the course of the disease and the shape of the sequestrum indicated a tertiary luetic gummatous necrosis of the alveolar process. The gingivitis and sequestration appeared in a circumscribed locality, not diffusely, as in the four other cases; the disease began about three years after the luetic infection.

It has recently been shown that a form of mercurial stomatitis, which occurs in syphilitic patients, is caused by spirochetes in the buccal mucosa. Such cases are amenable to salvarsan medication, this form of mercurial stomatitis being entirely curable by salvarsan. If salvarsan possessed any cumulative action in the presence of an existing mercurial stomatitis, it would have to manifest itself under these conditions where the buccal mucosa itself is so severely damaged as to be open to attack and increased inflammation through the superadded salvarsan treatment. Maxillary necrosis does not occur after salvarsan treatment, and no such cases have been recorded in the extensive salvarsan literature.

Root Amputations. J. Levy. *Dental Cosmos*, 1919, lxi, p. 649.

The majority of dentists consider apicoectomy advisable in cases of chronic apical infections in which the bone peridental membranes, and not more than the apical third of the root are involved.

The roots of the 6 upper front teeth are amputated most easily, while in the case of the 10 lower front teeth, the upper bicuspids, and the molars, this operation is difficult.

Gutta-percha is regarded as the best material for filling the root canals. The use of chloroform and resin, chlorapercha, or sucapercha with the gutta-percha seems to be a matter of choice.

When the operation is followed by check radiograms the percentage of successes is moderately high.

Failures are reported as due to faulty technic, low vitality of the surrounding tissue, and re-infection.

For removing the apex of the tooth, the burr is given the preference over the chisel.

Six months is the average time required for complete regeneration of the bone in successful cases but varies with the patient's age and vitality.

Suturing the incision is recognized as being the preferable method of closing the wound as it tends to hasten the healing, prevent re-infection, and lessen the after-pain. In cases of extensive involvement, packing is advocated.

Opinion is divided as to whether apicoectomy should be performed by the specialist or the general practitioner. It is generally conceded, however, that

unless the general practitioner is well equipped, has a thorough knowledge of asepsis, and has developed a skillful technic, the operation should be performed only by the specialist.

Experiences with Transplant Grafts in Ununited Fractures of the Mandible. C. E. West. *Proceedings of the Royal Society of Medicine. Section of Odontology*, 1919, xii, No. 9, p. 221.

In the eighteen cases under consideration, the graft was taken from the rib in two cases, from the iliac crest in eight cases, and from the tibia in nine cases. From whatever source derived, the essentials of a good transplant graft appear to be: (1) Sufficient substance to allow of satisfactory fixation. (2) Sufficient rigidity to give real immobilization. (3) A fair amount of cancellous bone which can be got into contact with the raw surface of the fracture ends. The essentials for satisfactory results may be stated as operative asepsis, use of extreme caution in avoiding too close an approach to the buccal cavity, actual contact of cancellous surfaces, and good fixation. At the end of the operation, the jaw should give the feeling of absolute rigidity. Because union implies vascularization, it is important that cancellous surface should be exposed on the areas with which the graft is to be in contact.

The results obtained in the Special Jaw Injuries Department, at the First London General Hospital, are fairly summarized in the following table:

Total transplant graft operations	19
Graft survived, apparently alive	17
Graft absorbed in presence of suppuration	1
Graft partially sequestered, union already secured....	1

Good union, 13 grafts; union satisfactory but with slight weakness at one end, 3 grafts; nonunion at one end, 1 graft; failure (absorption of graft) 1 case. Function, according to Dental Surgeon's Reports: Fairly good and improving, to complete restoration, 12 cases; poor, at date last seen, 4 cases; function not improved, 1 case.

Sympathetic Iridocyclitis and Possibly Related Processes in Other Parts of the Body. D. F. Harbridge. *American Journal of Ophthalmology*, 1919, ii, No. 4, p. 269.

This argument supports the idea that the essential causative agent of sympathetic ophthalmia may exist in the body outside of an injured eye, and be transmitted through the blood currents. Microorganisms entering the exciting eye through injury might become established elsewhere in the body. Based upon personal observations, the author emphasizes the vital importance of the existing condition of the teeth, tonsils, sinuses, or other possible foci of infection, capable of giving rise to a so-called sympathetic iridocyclitis, a heart lesion, or a joint infection. In the case of a patient 29 years of age, with a severe plastic iridocyclitis and marked signs of involvement of the other eye, two suspicious teeth were discovered and radiograms showed apical abscesses. Removal of the teeth was followed within ten days by practically complete recovery. Several years ago, a man 56 years of age, suffering from a severe attack of plastic iridocyclitis, was

seen by the author, who in considering this case in connection with more recent experience recalls that this patient had many decayed teeth and at times suffered severely with toothache. The question of a radiogram was not considered at that time; doubtless certain infective foci would have been observed. In view of present knowledge, the author is inclined to interpret sympathetic iridocyclitis as a secondary disturbance due to a local changed metabolism, the source of the agent being in the uveal tract of the injured eye or perchance, in some other part of the body, a part of a symptom-complex. A small apical tooth abscess may be responsible, containing perhaps a strain of streptococci with a special affinity for uveal tissue. A fuller understanding of the nature of sympathetic iridocyclitis demands a more searching investigation for possible related processes in other parts of the body.

When Teeth Are a Source of Focal Infection. L. B. Schlund. *Northwestern Medicine*, 1919, xviii, No. 7, p. 134.

The author emphasizes the importance of instructing patients to the effect that at the apex of a perfectly comfortable and useful tooth there may be attached a more or less virulent abscess. Pockets formed by irritation due to ill-fitting crowns and overhanging and unpolished fillings, particularly between the teeth, must also be taken into consideration. These pockets are frequently overlooked by any examination other than the x-ray. The most insidious of all dental lesions is probably represented by pyorrhea. Devitalized teeth are in many cases a positive menace, and at best are limited in length of life and usefulness. With special reference to caries, it is often necessary to perform temporary operations in order that nature may have a chance to aid and thereby lay a wall of defence, a thin layer of secondary dentin, between the pulp and the point of irritation. Later on, these temporary operations can be followed by permanent ones which will prevent the recurrence of caries and not cause sufficient shock to produce devitalization of the teeth. It is along these lines that the medical profession and dental profession must cooperate. As regards the filling of root canals, the author among fifteen hundred to two thousand teeth found only forty with canals filled to the end and twelve of these showed an abscess. Presumably, very few root canals are filled to the end, and these are always of the single roots, as the author failed to find a molar tooth, either upper or lower, with all the canals filled. Such teeth may and often do become a source of focal infection.

Composite Odontoma. F. B. Moorehead and K. W. Dewey. *Surgical Clinics of Chicago*, June, 1919, iii, No. 3, p. 645.

The authors report a rare case of composite odontoma in a young man twenty-three years of age. Although the origin of these anomalies is evident, namely, some disturbance in the development of the tooth germ, nothing is known concerning the cause of such disturbances. Trauma does not seem to play a part; although there are a few doubtful cases with a history of some external violence. The predominating substance in composite odontomas is dentin. Enamel is not constantly present, and may be entirely lacking. The presence of cementum is also inconstant. Bony substances are sometimes found. In the

authors' case, the convex surface of the tumor (which measured 3.5x2x2 cm. and weighed 20.5 gm.) was for the larger part of a dull grayish-yellow color, which was dentin tissue; the other part, about one-third, was covered with a pearly white, scaly layer of enamel, which was continued over almost the entire concave surface, where it assumed the form of stalactitic excrescences. The whole layer of enamel formation had a depth of 2 or more mm. The tumor was surrounded by a thick fibrous capsule; the presence of a connective-tissue capsule is mentioned only in a very few reported cases. The crown of a typical second molar tooth was placed against the surface of the tumor at its lower extremity. The specimen showed two roots fused into one; the smaller one was crippled in all dimensions, but distinct in outline, and was lying flatly and squarely on the other. In dissecting out and removing the fibrous sac, the inferior dental nerve was divided, but this has since regenerated, restoring sensation to the lower lip.

The Lipoids in Tumors of the Dental Region. K. W. Dewey. *The Journal of Cancer Research*, 1919, iv, No. 3, p. 263.

The lipoids in pathologic dental tissue are chiefly cholesterol, occurring as the stable ester compound, but much more frequently in more or less loose combinations with fatty acids and other lipoids. The fatty acids and soaps which are found in certain tumors are located chiefly in the zone of squamous epithelial cells. Otherwise, they occur in the degenerated walls of blood vessels in tissue with a depleted blood supply. Fatty acids and soaps are found in areas where hyaline degeneration and calcification also are observed. The question of whether, or how, these substances may be involved in the process of calcium depositions, has not been approached in the practical part of this study. The specimens were obtained from Dr. Moorehead's clinic for oral surgery, of the University of Illinois, and included endotheliomas, fibromas, giant-cell sarcomas, cysts and ordinary hypertrophy of the gum tissue. On the basis of conclusions arrived at in studying tumors and cysts of the dental region, for their lipid content, the author claims that by employing modern staining methods and utilizing the polarizing microscope, the nature of the different lipoids in tissues can be established with a fair degree of accuracy and in a much larger measure than was hitherto possible. The presence of cholesterol denotes life and activity; cells very seriously injured, although still alive, seem to be unable to store lipoids.

Chronic Superficial Glossitis as a Reflex Necrosis. H. C. Greve. *Münchener Medicinische Wochenschrift*, 1919, No. 17.

The author reports an observation on a nervous woman, at the age of the menopause, who had been operated upon for gastric ulcer under the erroneous diagnosis of carcinoma. Small excoriations, associated with severe pain, made their appearance on the border of the tongue, and the patient feared the development of lingual cancer. She suffered from so-called hairy tongue and typical superficial glossitis, the severe disturbances being the sequel of reflex neuralgia originating in the splanchnic system. The chronic intestinal disturbances which affected the patient at the time of the climacteric, were responsible for this nerv-

ous irritation, through pathologic circulatory and nutritional processes. The observer points out that superficial glossitis and glossodynia exfoliativa are two varieties of the same disease, the nervous etiology of which is indicated by the above case as well as a number of instances in the literature. The treatment must accordingly be directed especially towards existing general anomalies, in order to counteract the establishment of a reflex necrosis.

Diathermy for Epithelioma of Palate, Tonsils, Tongue, and Floor of Mouth. N. Patterson. *Proceedings of the Royal Society of Medicine. Section of Laryngology*, 1919, xii, No. 9, p. 182.

The author's patient was well nearly four years after the first appearance of the disease. He was a man 59 years of age, first seen in June, 1915, with epithelioma of the soft palate and right tonsil. Diathermy was applied twice within a short period. In April, 1917, the patient presented himself with an extensive growth involving the right side of the tongue and floor of the mouth. There was also a large swelling in the submaxillary region. The growth was treated with diathermy and the electrode was plunged deeply into the floor of the mouth in many directions. Shortly after this the mass in the neck was removed by dissection. At one time the case looked quite hopeless, but at the time of the present report the patient is well and able to work, and there is no sign of the original disease.

Survey Teeth. L. L. Zilva and E. M. Wells. *Proceedings of the Royal Society of Medicine*, 1919, B, xc.

The authors describe the changes observed in the structure of the teeth of scorbutic guinea pigs, on examination of a great number of teeth derived from animals in various stages of scurvy. It could be demonstrated that the mildest degree of scurvy, just discernible to the unaided eye at autopsy, led to the production of well-defined microscopic changes in the structure of the teeth in all the examined cases without exception. In advanced scorbutic conditions the teeth were found to be apparently sound but useless through having become loosened by the gradual absorption of the cement membrane of the alveolar pockets, leaving exposed the portion below the neck. This condition was presumably associated with periostitic pain. The teeth moreover presented all the appearance of senile change. In young guinea pigs, precisely the same condition was found as in the older animals. With monkeys as subjects, the production of radical changes in the teeth through a deficiency of the diet in antiscorbutics was likewise definitely established. Without drawing definite conclusions from their work at this stage, the authors suggest on the basis of their findings in animals, that deficiency in diet may be shown by future research to be responsible for the great prevalence of dental decay among civilized communities.

Dental Infections in Children. A. L. Smith. *Archives of Pediatrics*, 1919, xxxvi, No. 3, p. 148.

The author's report covers 109 cases of peridental infections in children, collected from the available medical literature. The children's ages ranged from

two and a half to eleven years. Four secondary fistulæ, eight gingival abscesses, one abscess in the roof of the mouth and one infected submaxillary gland are also included. The relationship existing between periodental infections and systemic diseases is not considered in the present contribution, which deals essentially with causative factors. The following is a table of the microorganisms and their number, found in the 109 cases of periodental infections:

1. Streptococcus hemolyticus	27
2. Streptococcus pyogenes	19
3. Streptococcus viridans	2
4. Staphylococcus pyogenes citreus	9
5. Staphylococcus pyogenes aureus	37
6. Staphylococcus pyogenes albus	7
7. Bacillus pyocyaneus	1
8. Diplococcus pneumoniae	18
9. Micrococcus catarrhalis	4
10. Bacillus fusiformis (Vincent's angina) Spirochete Vincenti....	1
11. Diphtheroid bacillus	3
12. Sterile	8

Children's teeth, infected as they are, must be extracted, if the focus can not otherwise be sterilized, and this rarely can be accomplished. Malocclusion as an indirect result of premature extraction of deciduous teeth is a lesser evil than the constant absorption of infected material from the periodental area.

The Toothless Mother. Note in Lancet, London, 1919, i, p. 922.

The National League for Health, Maternity, and Child Welfare, in London, England, is about to try an interesting experiment, made possible by the generosity of Miss Gibson, who out of a donation of two thousand pounds to the League, has asked that five hundred pounds be spent on facilitating the provision of dentures for mothers attending welfare centers in London and Greater London. A whole-time dental mechanic is therefore to be engaged and a work-shop fitted up for him, where dentures ordered by the dentists engaged at dental clinics attached to mothers' centers will be made, only the cost of the materials being charged. Since the charge for labor is the most expensive part of dentures, it is hoped in this way to reduce the present high cost of teeth for necessitous mothers, thousands of whom are perhaps injuring their babies through their mouths being septic. The Children's Jewel Fund is contributing two hundred and fifty pounds towards the scheme, which should also encourage the establishment of more dental clinics for mothers, now greatly needed.

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EDITORIALS

The Possibilities of the American Society of Orthodontists

IN this issue of the JOURNAL will be found an advance copy of the program of the next meeting of the American Society of Orthodontists. In looking over this program one can not help but be impressed with the possibility of good that can be derived from such papers, provided the members enter into the spirit of the meeting as the officers of the society have intended they should. From the standpoint of one who is more or less familiar with the American Society of Orthodontists since its organization, we can say that we know of no program that covers the field of orthodontics more completely than the program which has been arranged for the coming meeting. The Board of Censors have secured eight excellent papers and one more. If any criticism were to be made regarding the number of papers, so far as producing a good meeting for the entire membership, we would say that the Board of Censors has probably secured more papers than can be satisfactorily discussed in a three-day meeting.

There was a time when the society was composed of a smaller number of members than it is now, and the tendency of the Board of Censors was to collect a great number of papers, because the discussion would probably be limited. However, as the membership has increased, and the society is now made up of men who have spent a number of years in practice, and also of newer men whose practical experience is more limited, it seems to us that one of the greatest advantages of the Society from the standpoint of all the membership, would be to have free and unlimited discussions of the papers. We remember at the last meeting in St. Louis at least two very excellent papers were read that received no discussion. In fact, one of the essayists was so crowded for time that he gave his paper in a very hurried manner in order to catch the train for the East. As the result of this haste, a great amount of good which could have been produced by a free discussion of those two papers remained dormant, because every one in the society felt time was limited, so consequently did not enter into the discussion. There are, on the other hand, a number of men who object to the discussion of the papers, and are of the opinion that it should be limited in the meeting, and that it should also be limited in the publication of the proceedings. We realize that very often in the discussion of a paper the man who has the floor may not be telling anything new or interesting to a half dozen of the members present, but there may be others in the society who are benefiting by the discussion. It therefore follows that members of such societies as the American Society of Orthodontists should be at least courteous enough to listen to the discussor, even though they may not agree with him or be particularly interested in what he is saying on the subject. A society as large as the American Society of Orthodontists should be conducted for the good of the greatest number, and not for the advancement of the pet ideas of a selected few.

In selecting papers for the 1920 meeting the Board of Censors have tried to cover the orthodontic field in a satisfactory manner and secure papers some of which dealt with the practical side of orthodontia and problems which are prominent in practice today, as well as a number of papers which may be termed "scientific" that have a bearing on orthodontic facts. In doing this they have also attempted to arrange the papers in logical order, and consequently have placed the paper by Dr. W. K. Gregory on "The Evolution of the Human Dentition," first. To those who have been so mechanically inclined as to avoid the study of the development of the teeth and the supporting structures from a histologic or evolutionary standpoint, this paper at first sight probably seems to have very little practical bearing. However, we are convinced that a large number of etiologic factors in malocclusions, conditions of underdevelopment and overdevelopment, as well as the shape and size of certain individual teeth, can be traced back to the evolutionary influences which have been operating upon the dental apparatus ever since animals first possessed teeth. From a personal acquaintance of Dr. Gregory, we know he is one of the few men who has devoted a great amount of time to the study of the human dentition from an evolutionary standpoint, and we are convinced that he will give many facts that are very interesting and instructive, provided his audience familiarize themselves enough with comparative and human dental anatomy, as well as the embryology of the parts, to be able to assimilate his paper. Following this is placed a paper

by Dr. Milo Hellman, on "The Etiology of Malocclusion." We are more or less familiar with the work which Dr. Hellman has been doing in the past years, and also since the last meeting of the society in St. Louis, and can, therefore, assure our readers that he will present a number of facts that have never been gathered together before. Following this on the afternoon of the first day Dr. Kemple will read his paper, "Our Limitations in Orthodontia." Dr. Kemple is one of the members of the society who has spent a number of years in the special practice of orthodontia and will probably rank among six men in the Society so far as years of practice are concerned. As a result of this, he is able to present a paper on a subject that at first glance may seem more or less revolutionary, but that is, nevertheless, extremely practical, because we must realize that there are certain limitations in orthodontia, which a few years ago were not considered as such. There was a time when a number of men believed that a normal occlusion, or, in reality, an ideal occlusion, could be obtained in every case; but that was before malocclusions were recognized as pathologic conditions influenced by a large number of systemic disturbances over which the practitioner had no more control than other specialists have over certain conditions they encounter in the human body. Briefly, we may say that our limitations in orthodontia are circumscribed by the condition of the material or tissue which we are compelled to work upon, and the sooner young men recognize that condition, the less likely will they be to promise their patients results which they can not accomplish. This paper should open up a large field of discussion, and if the various members will be frank enough to tell the truth about some of their cases, volumes of information will be available which probably has been kept in the dark for some time.

The Board of Censors, realizing that pathologic conditions have a close relation to the etiology of malocclusion and also a bearing upon the permanency of the results obtained, have been able to secure Prof. A. Hopewell Smith, who will give a paper on "Recent Advances in Oral Pathology." This paper will be followed by one on "The Pathology of Dento-Facial Deformities," by Dr. B. E. Lischer, of St. Louis, who for a number of years has made a special study along these lines and photographed a large number of cases and collected invaluable data dealing with the conditions. We believe it is not the intention of the board of censors that these two papers should be in any way related or be discussed together. We are convinced that when two papers are discussed together, even though they are more closely related than the papers by Prof. Smith and Dr. Lischer, one suffers from neglect. The members will obtain more good from these papers if they keep them separate, and be prepared to discuss them separately.

The next paper, is that on "Plastic Surgery" by Dr. J. C. Beck, of Chicago. While this subject is not strictly an orthodontic one, still it has a relation in regard to dentofacial deformities with which the orthodontists must be familiar. Before passing this paper, we feel that it would be unfair not to call attention to the men who have been placed on the program to discuss it. In the first place, the Society is to be congratulated on possessing two men of the types of Major Jos. D. Eby, and Lt.-Col. Guy Hume. Major Eby left the private practice of orthodontia when America entered the war, and was very soon given a position in the Dental Officers' Training School organized by Col. Logan. With

the signing of the Armistice and the discontinuation of the Dental Officers' Training School, Major Eby was transferred to the Walter Reed Hospital, where he is still stationed in the Maxillo-Facial Department and has done an enormous amount of work in maxillo-facial restoration. Lt.-Col. Guy Hume was a member of the Board of Censors of the American Society of Orthodontists. He went overseas with the first Canadian troops, and remained on the active front practically the entire duration of the war.

Following a number of papers covering various principles in orthodontics, the next two subjects deal with the practical side of the science, one in regard to regulating appliances, and the other in regard to the Principles in Retention. Dr. V. H. Jackson will give a paper on the "Principles of the Jackson Removable Appliance," which appliance possesses a great many valuable features that some men have failed to recognize even up to the present time. We hope that the members of the Society in discussing this paper will confine themselves to the subject: namely, the principles of removable appliances, and not try to bring in some pet hobby of their own to befog the issue. We remember in times past when papers on the principles of appliances have been read before the Society, there has been a tendency not to discuss the factors as indicated and outlined in the paper, but rather to enter upon some pet theory or device, such as the modification or an improvement of the appliance, which had absolutely nothing to do with the paper. We remember a paper was read at the American Society of Orthodontists at Excelsior Springs, dealing with certain forms of appliances: instead of those appliances being discussed, various members got off the issue and discussed "how to rotate a certain tooth." The next year a paper was read at the Chicago meeting with exactly the same results: the principles of appliances were not discussed at all, but the majority of time was taken up by the discussion of appliances that had not even been mentioned in the paper. There are certain basic features employed in the construction of regulating appliances that must be considered and followed out and that are much greater than any idea upon which some individual man may have obtained a patent.

The committee has been fortunate in obtaining Dr. Calvin S. Case to write a paper on "The Principles of Retention in Orthodontia," on which we can again say we hope the members of the Society will confine themselves to principles of retention. We are aware that retention is one of the biggest subjects in orthodontia today, and it would be possible for three or four papers to be presented dealing with that one subject alone. In fact, it would be possible to have several papers presented on the etiology of malocclusions and several more on retention, which two subjects would be sufficiently large for a three-day meeting. We fear that in the presentation of Dr. Case's paper on "The Principles of Retention" some of the members are again going to diverge from the subject and instead of confining themselves to the issues, will discuss a retaining appliance that they have employed in some particular case. Such a thing would be perfectly proper if one entire day were given to the discussion of principles of retention in addition to the retention employed in certain types of malocclusion and several different men were selected to write papers on this subject. In other words, if a symposium on retention was arranged by the Board of Cen-

sors giving an entire day to that subject, we feel that a great amount of good could be accomplished for the entire membership of the society.

We would also suggest that various members who are going to attend the meeting familiarize themselves with the topics as outlined in the program and be prepared to intelligently discuss or at least ask intelligent questions upon the subjects presented. We believe that the Board of Censors have done their duty, and they rendered the society an excellent service by securing these various papers, and it remains for the individual members to say how much they are going to get out of these papers or whether they are going to try to make this a "special affair." If the American Society of Orthodontists is to grow and develop into a scientific body, it will have to be through the united efforts of the members, because the various officers have done practically all they can when they have prepared the excellent program which is published in this issue.

For Wednesday a number of interesting clinics and case reports have been arranged. Under the heading of case reports it is the wish of the Board that members will show unusual cases which have presented interesting etiologic factors and which have shown certain problems in treatment that are out of the ordinary. The older men are also being appealed to for cases three years after retaining appliances have been removed, which is in keeping with Dr. Kemple's paper on "Our Limitations in Orthodontia." We are convinced that because of evolutionary factors, etiologic problems, and pathologic conditions, all of which will be dealt with in papers at this coming meeting, we find a certain number of malocclusions in which it is absolutely impossible to obtain an ideal result. We know that the oculist finds certain cases in which he can not correct the vision without the permanent use of glasses; we also find the rhinologist forced to perform various surgical operations in order to improve the breathing. Therefore, the orthodontist is rather foolish to believe that with all the various etiologic factors and conditions that may be encountered he alone of all the medical specialists is able to produce an ideal result under all circumstances. It is the tabulation of these various conditions that can be brought about by case reports that the board of censors are desirous of obtaining, and we are sure that anyone with such a case will receive a favorable consideration if they will kindly report it.

Raise In Subscription Price

WITH the February issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA AND ORAL SURGERY, the subscription price will be raised to \$5.00. As a reason for this increase, we only need point to the fact that cost of printing and paper, and the making of illustrations, has increased from one hundred to three hundred per cent since the Journal was started five years ago.

The publishers feel that the readers of this Journal prefer to pay an additional cost of two dollars the year rather than have the quality of the Journal lowered in any particular.

Through the medium of this publication, orthodontia has assembled a literature during the past five years that rivals that assembled by any specialty in medicine. During this time nearly five thousand pages of text matter with between thirty-five hundred and four thousand illustrations pertaining to orthodontia and its allied specialties have been published in it.

Every nation on the globe where dentistry is practiced is represented among its subscribers. Orthodontia as a specialty has developed during the past five years far beyond the wildest dream of its founders, and this journal has played no inconspicuous part in its development.

The success attending this undertaking has convinced the friends of dentistry that an independent special journal can live, and that it is not necessary for a journal devoted to the upbuilding of dental science to be sponsored and maintained by dental manufacturing concerns.

ORTHODONTIC NEWS AND NOTES

The editors desire to make this department a permanent feature of the Journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

Meeting of the American Society of Orthodontists

THE Twentieth Annual Meeting of the American Society of Orthodontists will be held at the Edgewater Beach Hotel, Chicago, Ill., Monday, Tuesday, and Wednesday, April 5, 6, and 7, 1920.

The Board of Censors have arranged the following program to which will be added a number of clinics and reports of cases. The list of clinics is not complete at this time.

Monday, April 5, 1920

President's Address.

John G. V. Mershon, Philadelphia, Pa.

Report of Board of Censors on new members and election of officers.

Report of committees, unfinished business, new business.

Monday, 2 p. m.

Evolution of the Human Dentition.

W. K. Gregory, New York City.

Discussion opened by:

A. LeRoy Johnson, Boston, Mass.

Martin Dewey, Chicago, Ill.

The Etiology of Malocclusion.

Milo Hellman, New York City.

Discussion opened by:

B. W. Weinberger, New York City.

O. A. Oliver, Nashville, Tenn.

Our Limitations in Orthodontia.

F. C. Kemple, New York City.

Discussion opened by:

J. Lowe Young, New York City.

Samuel P. Cameron, Philadelphia, Pa.

Tuesday, April 6, 9 a. m.

Recent Advances in Oral Pathology.

A. Hopewell Smith, Philadelphia, Pa.

Discussion opened by:

H. E. Kelsey, Baltimore, Md.

Ralph P. Waldron, Newark, N. J.

The Pathology of Dento-Facial Deformities.

B. L. Lischer, St. Louis, Mo.

Discussion opened by:

W. A. McCarter, Topeka, Kansas.

Walter Ellis, Buffalo, N. Y.

Tuesday, 2 p. m.

Plastic Surgery.

J. C. Beck, Chicago, Ill.

Discussion opened by:

Maj. Jos. D. Eby, Walter Reed Hospital.

Lt.-Col. Guy Hume, Toronto, Canada.

The Principles of the Jackson Removable Appliance.

V. H. Jackson, New York City.

Discussion opened by:

C. W. B. Wheeler, New York City.

Wm. H. Gilpatrick, Boston, Mass.

Principles of Retention in Orthodontia.

Calvin S. Case, Chicago, Ill.

Discussion opened by:

F. M. Casto, Cleveland, Ohio.

C. A. Hawley, Washington, D. C.

Tuesday, 6:30 p. m.

Banquet and Roll Call.

Wednesday, April 7, 9 a. m.

Clinics and Case Reports.

Wednesday, 2 p. m.

The Indication and Counterindication for the Extraction of Teeth for the Purpose of Correcting Malocclusions.

Martin Dewey, Chicago, Ill.

Discussion opened by:

J. A. Burrill, Chicago, Ill.

Herbert Pullen, Buffalo, N. Y.

Alumni Society of the Dewey School of Orthodontia

The next annual meeting of the Alumni Society of the Dewey School of Orthodontia will be held at the Edgewater Beach Hotel, Chicago, Ill., April 1, 2, and 3, 1920.

The following program has been arranged to date, which includes both papers and clinics:

President's Address.

E. G. Weeks, Saginaw, Mich.

Impactions of Temporary Teeth.

Frank M. Casto, Cleveland, Ohio.

Why We Insist on Early Orthodontic Treatment.

T. G. Duckworth, San Antonio, Texas.

Calcification of the Bones, and Its Bearing Upon Malocclusion of the Teeth.

Milo Hellman, New York City.

Getting on with Children in the Practice of Orthodontia.

Geo. F. Burke, Detroit, Mich.

A New Type Molar Band and Locking Device for Lingual Appliance.

Joseph E. Johnson, Louisville, Ky.

The Soldered Lingual Arch, and the Principle of Anchorage.

Martin Dewey, Chicago, Ill.

Treatment of Class One Cases.

Oscar Busby, Dallas, Texas.

Orthodontic Principles in Facial Injuries.

Maj. Joseph D. Eby, Walter Reed Hospital, Washington, D. C.

Failures or Unsatisfactory Cases in Orthodontic Treatment.

D. S. Sterrett, Erie, Pa.

Spring Attachments for Tooth Movement.

A. C. Gifford, Oshkosh, Wisc.

Modification of Roach Impression Trays for Making Metal Models of Teeth to be Banded, Facilitating the Accurate Fitting of Bands.

Landis H. Wirt, South Bend, Ind.

Hygienists for Orthodontists.

H. B. Hamilton, Ithaca, N. Y.

The Use of Pin and Tube Appliances, Using Half-round Pins.

Geo. W. Grieve, Toronto, Canada.

A Treatment of Open Bite Conditions.

Martin Dewey, Chicago, Ill.

The Use of Court Plaster as Used in Mouth Breathing.

Geo. Burke, Detroit, Mich.

The Multiple Loop Stationary Lingual Appliance.

C. E. Byington, Chattanooga, Tenn.

O. A. Oliver,

Chairman of Program Committee,
Nashville, Tenn.

Notes of Interest

Dr. C. Verne Smith has opened his office in the Mason Building, Saginaw, Mich., for the practice of orthodontia.

Dr. Thad Morrison and Dr. Donald Morrison announce the opening of their new offices, 909-11 Candler Building, Atlanta, Ga.

Dr. James W. Ford, Jr., has opened his office in the Stevens Building, 17 N. State Street, Chicago, Ill., for the practice of orthodontia. Dr. Ford has also taken a position as Clinical Demonstrator of Orthodontia at the Chicago College of Dental Surgery.

Dr. Chilton E. Byington announces to his clientele and friends that his future practice will be limited to orthodontia, 1115 James Building, Chattanooga, Tenn.

Dr. Ed. J. Copping announces the opening of his office at 921 Fifteenth St., N. W., Washington, D. C., for the practice of orthodontia.

Dr. W. B. Childs announces the opening of his office at 706 Candler Building, Atlanta, Ga., for the exclusive practice of orthodontia.

Dr. E. B. Arnold announces the opening of his office at 915 Union National Bank Building, Houston, Texas, for the exclusive practice of orthodontia.

Dr. L. James Porter has accepted a position on the Orthodontia Clinical Staff of the College of Dental and Oral Surgery of New York.

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No. 3

ORIGINAL ARTICLES

DENTAL-OCCLUSAL CLASSIFICATION OF MALOCCLUSION

BY CALVIN S. CASE, M.D., D.D.S., CHICAGO, ILL.

THE principal object of a classification in any of the sciences is to enable one to obtain quickly a general mental grasp of the thing referred to, and to recognize it or to define it as distinguished from other things of a similar nature, thus producing a clear mental flashlight-word picture of the thing itself. This is accomplished through a systematic arrangement of the objects or material into distinct groups, classes, divisions, types, etc., each one of which is characterized by some stable peculiarity in form, structure, or property of *recurring constancy, not found elsewhere in the classification*. Therefore, in naming a class in any classification, with the division of that class, and the type of the division of the class, we have presented a mental picture of the thing and its peculiar distinguishing characteristics.

In an attempt to follow this commonly accepted system of nomenclature with a view to intelligently classify malocclusions of the teeth, we are confronted with somewhat the same difficulties that confronts the science of medicine in classifying diseases.

In orthodontia, the present most popular accepted basis for the classification of malocclusions is the disto-mesial occlusal relations of the buccal teeth. This naturally divides malocclusions into three classes as follows: In Class I, the disto-mesial occlusal relations of the buccal teeth are normal or nearly so. In Class II, the disto-mesial occlusal relations of the lower buccal teeth are about the width of a cusp distal to normal; and in Class III, the disto-mesial occlusal relations of the lower buccal teeth are about the width of a cusp mesial to normal.

The consistent reason for this natural division into the three classes is as follows: In a normal occlusion of the teeth, the cusps of the buccal teeth of one denture fit evenly and anatomically into the sulci of the other. During the eruptive stage, if from some cause they do not quite take this exact anatomic relation, the forces of mastication soon drive them fully into it along the in-

clined planes of the sliding facets; except in those cases where certain causes, local or inherent, have forced the teeth to erupt so that the crests of the cusps of one denture are more or less outside the grasp of their normal spheres of influence. In this instance they at once commence to drift along the inclined planes toward the wrong, or abnormal sulci, until they have fitted themselves as closely as possible into their interlocking grasps, with the result that the buccal teeth of one denture in relation to the other, on the right or the left, or both sides, are commonly found to occlude in normal, or about the width of a cusp mesial or distal to normal occlusion.

As the teeth erupt and come into contact with their masticating fellows, they are often forced to move disto-mesially and bucco-lingually, from their erupted positions through the fitting processes of their cusps, in exactly the same way that they are moved by orthodontic forces. There is no doubt that whole dentures are frequently caused to move antero-posteriorly to a considerable extent by the mesial or distal movement of their masticating teeth in Nature's processes of fitting the cusps into their normal or abnormal interdigitating sulci, which constitutes the basis of our present three classes of malocclusion.

While this **dento-occlusal classification** here presented is quite different from the Angle classification, it will be found by teachers and students, of the greatest practical value, enabling a systematic presentation of the most advanced principles of dento-facial orthopedia, at present unequaled by any other classification. For the very great advantage of perfect harmony and unanimity in our literature and teaching, I would have gladly adopted the Angle classification were it not for the fact that as it now stands it can not be made to express a large number of very important characters of malocclusion which should be fully recognized and systematically scheduled as independent Divisions, or Types of Divisions of one or the other of the three Classes. Furthermore, the Angle classification does not recognize those *wide differences* in the character of certain malocclusions which have the *same disto-mesial occlusion* of the buccal teeth. It will be found by a careful study of malocclusions that these differences in dento-facial characters and demands of treatment *within each class* are fully as great and quite as important in orthodontia as the differences which arise between the characters of one class and another.

Note the wide distinctively different characters within each one of the three classes shown by the chart on page 139, and then let me ask: that if we take the disto-mesial occlusal relations of the buccal teeth as the distinguishing standard or basis of our classification, must we not necessarily place in each one of the classes—in the divisions or types—*all the distinctive recurring characters whose buccal occlusion corresponds to the basic occlusion of the class?*

When we name a class to which a certain malocclusion belongs, we convey a mental picture of *only* the disto-mesial occlusal relations of its buccal teeth and nothing more, except the fancied conception of its real character and dento-facial relations. And when we go further, and name the Division of its Class, we still have placed it only as one of a family of malocclusions whose individual members may differ quite decidedly from each other, though all are alike in one distinguishing characteristic. Neither can we place in the mind's eye the individually completed character of the case in hand until we have named its

Type, its Division, and its Class. There are, however, certain Divisions whose different types are so similar they require no mention in a classified chart, though in practical treatment they may differ considerably, all of which with a variety of variations should be fully outlined in the textbook teaching. In this classification, the family or divisional characteristic is based upon dento-facial relations, except in Division 1 of Class I, which it has seemed best, for teaching purposes, to distinguish as having arisen from a local cause, though differing quite decidedly in their dento-facial relations.

As a large majority of orthodontists have already become accustomed to divide malocclusions according to the three distinct occlusions of the buccal teeth—normal, mesial, and distal—the placing of all the commonly recurring dento-facial types which have a similar occlusion, in one class, will doubtless give a greater opportunity to define their wide differences in character and demands of treatment, and thus prevent as far as possible the too common error of treating cases alike on the basis of their occlusal similarity. It is hoped also, that it will tend toward preventing the insistence of placing certain dentures in a normal occlusion whose deforming facial protrusions demand extraction. And on the other hand, it is most earnestly hoped that it will prevent the extraction of teeth by those who unfortunately have made a wrong interpretation of my teaching. It certainly should appeal to those orthodontists who favor the occlusal classification, and whose highest aim in practice is a truthful and scientific diagnosis of their cases.

To those who believe that no teeth should ever be extracted for the dento-facial correction of the decided unimaxillary and bimaxillary protrusions, Dr. Angle's classification will be found quite consistent with that system of practice.

It was because of the marked differences in the character, facial outlines, and required treatment of malocclusions in Class II—in which the upper denture is about the width of a cusp in front of a normal occlusion—that led me to divide this class in a former classification, into Classes II and III, as I believed this would more strongly emphasize the importance of a differential diagnosis of dento-facial characters having the same occlusion of the teeth, certain types of which demand the extraction of teeth in their proper correction, while with others, such a procedure would be decided malpractice. In other words, it was my desire to free it from the mechanical and mathematical trend toward which the science seemed to be drifting, and to induce a deeper consideration and study of facial art and beauty as important factors of diagnosis and treatment. With the present advancement in the practical principles of orthodontia, it is hoped that a systematized arrangement of all the distinctive types of malocclusion under three heads, upon the basis of their occlusal peculiarity, will enable a full appreciation of the wide differences in dento-facial outlines with patients having, practically, the same occlusal relations of the teeth.

By carefully scanning my present classification, it will be seen that while the distinct characters of malocclusion are now divided among the three classes upon the basis of their disto-mesial occlusion, their true basis of diagnosis and treatment is dependent very largely upon the facial outlines in relation to the standard of esthetic perfection for the individual, because it is not otherwise

possible as a guide to treatment to determine whether the dentures—one or both—are really protruded or retruded.

While the dento-occlusal classification possesses the advantage of enabling us to divide and segregate a great variety of malocclusions into a smaller number of classes, it will be found as one becomes more and more advanced in the science of orthodontia, that there will arise a fuller appreciation of the fact that the disto-mesial occlusion of the buccal teeth is a very uncertain and often misleading guide as a basis of diagnosis in determining real conditions and the kind of treatment demanded, because in every one of the three classes—if all their distinct characters of malocclusion are tabulated—there will be found remarkably diverse characters of dento-facial deformities and malpositions.

One of the most dangerous features of the Angle classification, as formerly set forth, and one which, strange to say, has tended to popularize it in the minds of orthodontists, is the universally applied teaching that when dentures are placed in normal occlusion, the facial outlines will take care of themselves; and therefore, the highest possible orthodontic attainment for that individual is accomplished. If this were as true as it is believed by many, it would simplify the whole practice of orthodontia, because in theory it eradicates the necessity of a deep comprehension of dento-facial art, and many other important principles which are so difficult for orthodontists to understand.

A careful study of the great question of extraction which is so largely dependent upon Causes, and which lies at the very foundation of advanced dento-facial orthopedics, must convince every receptive truth-seeking mind, striving for the highest attainments of his art, of the delusiveness of a teaching which asserts the *universal applicability* of the "normal occlusion theory," which means that every tooth or its artificial substitute is necessary for the perfect correction of dental or dento-facial malocclusions.

In adopting the occlusal classification, therefore, it should be remembered that the disto-mesial character of a buccal malocclusion is no more or less than one of the incidents of the case in hand, requiring correction if demanded, along with other malpositions which may be present, and which are equally important to correct. It is one, moreover, that demands to the fullest extent that the masticating cusps shall be in perfect interdigitating occlusion; and furthermore—it goes without saying—they should always be placed in normal occlusion, except in those comparatively few instances where this rule is inconsistent with imperative facial demands.

There are, however, certain special and quite common malpositions which are found in every one of the three classes, because they arise from local causes, which may attack any inherited disto-mesial occlusion of the teeth, and therefore, they can not be classified as special divisions or types of any one particular class, notwithstanding the fact that they frequently dominate and characterize the whole malocclusion of the case in hand. This refers to Maleruption of Cuspids, Thumb-sucking Protrusions, Lateral Malocclusion, Open-Bite Malocclusion, Infra- and Supra-Occlusions, Malalignments, Malturnd Teeth, Contracted and Expanded Arches, Abnormal Interproximate Spaces, and Impacted Teeth. It is quite as important that the principles and treatment of these malocclusions be taught, as those of the distinctly classifiable characters.

Inasmuch as the first four of this group produce at times quite marked facial imperfections, and as all locally caused malocclusions arise most frequently in connection with normal occlusions, these special characters of malocclusion are placed in the Practical Treatment of Class I, Division 1. The "Practical Technic Treatment" of the rest of this group of irregularities is fully outlined separately, with the view of showing the different methods which I employ for their correction in connection with the classified malocclusion in which they arise.

CLASSIFIED TABLE OF DENTO-FACIAL MALOCCLUSION

CLASS I. NORMAL DISTO-MESIAL OCCLUSION OF THE BUCCAL TEETH.

Division 1: Locally Caused Dento-Facial Malocclusions.

TYPE A: UNILATERAL MALERUPTION OF CUSPIDS.

TYPE B: BILATERAL MALERUPTION OF CUSPIDS.

TYPE C: BILATERAL MALERUPTION OF CUSPIDS REQUIRING EXTRACTION.
(FROM CLASS II.)

TYPE D: PROTRUSION OF UPPER FRONT TEETH.

TYPE E: RETRUSION OF UPPER FRONT TEETH. (TREATED IN DIVISION 2, CLASS III.)

TYPE F: LATERAL MALOCCLUSION.

TYPE G: OPEN-BITE MALOCCLUSION.

Division 2: Bimaxillary Protrusion and Retrusion.

CLASS II. DISTAL MALOCCLUSION OF LOWER BUCCAL TEETH.

Division 1: Retrusion of Lower Denture.

TYPE A: PRONOUNCED RETRUSION OF LOWER DENTURE, WITH UPPER NORMAL.

TYPE B: MODERATE RETRUSION OF THE LOWER DENTURE, WITH MODERATE PROTRUSION OF THE UPPER DENTURE.

Division 2: Protrusion of the Upper, with Lower Normal.

TYPE A: UPPER CORONAL PROTRUSION.

TYPE B: UPPER BODILY PROTRUSION.

TYPE C: UPPER CORONAL PROTRUSION WITH APICAL RETRUSION.

TYPE D: UPPER APICAL PROTRUSION WITH LINGUAL INCLINATION.

Concomitant Characters of Class II.

RETRUSION OF THE MANDIBLE AND LOWER DENTURE.

CLOSE-BITE MALOCCLUSIONS.

MALERUPTION OF CUSPIDS. (TREATED IN CLASS I.)

CLASS III. MESIAL MALOCCLUSION OF LOWER BUCCAL TEETH.

Division 1: Bodily Retrusion of the Upper Denture and Maxilla.

(With lower normal, though apparently protruded)

Division 2: Contracted Retrusion of the Upper Denture.

(Due to inhibited development of maxillæ)

Division 3: Retrusion of the Upper with Protrusion of Lower Denture.

(With no protrusive position of the mandible)

Division 4: Retrusion of the Upper with Prognathic Mandible.

(Commonly accompanied with Open-Bite Malocclusion)

In regard to the Classified Table of Dento-Facial Malocclusions here presented, it should be understood that only the distinguishing types of the different Divisions of the Classes are stated in the accompanying table.

It was my hope to present this subject, illustrated with lantern slides before the American Society of Orthodontists, where it would be subjected to a free discussion of the propositions; though I may be pardoned for believing that a competent discussion of so much importance as one which proposes a radical change in an accepted classification of malocclusions should not be engaged in without a deep unbiased study of the changing demands in our advancement, and the broad principles involved in this new classification.

For my benefit and instruction as a teacher, and for the benefit of many others who are more or less guided by my teaching, I should like to have published in subsequent numbers of this or other dental journals, a free friendly discussion of the merits and demerits of this classification from the pens of distinguished orthodontists, with specific statements in regard to its faults and reasons why it should not be adopted as an improvement, at least, over the present dento-occlusal classification.

This would give me an opportunity to more clearly define certain parts which may not be fully explained or understood, and to accept with thanks irrefragable suggestions for its improvement in character or phraseology, with the hope that we may finally arrive at a classification that can be acceptably adopted as the standard nomenclature of malocclusions and of teaching and practice. There is nothing in my opinion that could advance orthodontia so much, or do more to carry it out of the quagmires of prejudice, distrust and uncertainty, and place it on a sure foundation as a science.

TREATMENT OF IMPACTIONS AND INFRAOCCLUSION AND CASES*

BY ELIZABETH E. RICHARDSON, D.D.S., SAN FRANCISCO, CAL.

IT gives me great pleasure to be present once more at a meeting of this society, and to have the privilege of submitting for discussion the results of my treatment of impactions and infraocclusion cases.

We are all striving for the highest ideals and there is nothing that will incite one to greater effort in the work than to be present at these meetings, that we may enjoy the many opportunities this society affords.



Fig. 1.



Fig. 2.

Orthodontics, as a specialty of dentistry and medicine, has become recognized by many as one of the most important branches of these professions. Let us make an effort to be present at these meetings and to contribute whatever we may to the progress of this science.

The treatment of infraocclusion, or open bite cases, has been a subject of much interest to me, and there are many things to be considered in the treatment of these cases.

*Read before the Alumni Society of the Dewey School of Orthodontia, St. Louis, Mo., March 6, 7 and 8, 1919.

The etiology of many of the infraocclusion cases is rickets, while some are due to habits.

In rickets there may be a thickening of the alveolar process, narrow arch, overdeveloped mandible, and the teeth are sometimes tipped lingually. If there is faulty bone formation, slow and careful treatment is then indicated.

TREATMENT

A simple course of treatment may be used by placing molar bands and buccal tubes on the first permanent maxillary molars, and lingual wires extending from the molar bands to the first premolars, as showing in Fig. 6. The expansion arch is then adjusted to rest upon the anterior teeth, placing the



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.

mesial to the tubes. Wire through the interproximal spaces between the first and second premolars, engaging the lingual wire and the expansion arch. This causes force to be exerted upon the anterior teeth under the stress of mastication. Expanding the arch relieves the close contact of the anterior teeth, and the force exerted upon them by the expansion arch causes the teeth to erupt. I place molar bands on the anterior teeth to protect them from abrasion of the expansion arch. For treatment of the inferior arch, I use lingual or labial arches with finger

tension springs where indicated. The result of this treatment is most gratifying, with little or no soreness. I remove the appliances for a period of rest several times during the course of treatment, allowing Nature to do her part in the development.

To obtain permanent results in these cases, the treatment should progress slowly. Fig. 1 shows the case before treatment. Fig. 2 shows the progress of the case. The appliances have been removed for a rest period of four months.

Figs. 3, 4 and 5 show a case of infraocclusion due to a tongue habit, and is now under treatment in the same manner as I have described, but in a much shorter period of time and with the cooperation of the patient, which is of much importance in correcting the tongue habit, the prognosis is favorable.



Fig. 7.



Fig. 8.



Fig. 9.

Fig. 5 shows progress of case. The treatment outlined in this case is to lengthen the incisors, canines, and premolars in the maxillary arch; if the upper lip is short, I lengthen the teeth in the inferior arch to more evenly divide the development. Expand the maxillary arch and carry out whatever treatment that may be indicated in the mandibular arch. The lip can be lengthened by daily exercise drawing it downward.

IMPACTIONS

Fig. 7 shows a case of impactions of the six anterior teeth. The patient, ten years of age, was suffering from extreme nervousness and mental depression.

Molar bands were placed on the superior first molars, with a lingual arch

resting against the premolars and deciduous canines, and by the use of the wire stretchers, which cause a gentle stimulus to the arch, sufficient space was made for the impacted teeth to erupt.

Fig. 8 shows progress of the case after six months' treatment. The condition of the patient both mentally and physically is normal.

Fig. 9 shows a case of impacted central incisor and canine of the maxillary arch.

By the use of the x-ray, the impacted teeth were located, showing the canine locked under the central incisor. An opening was made directly over the central incisor, exposing the entire lingual surface of the tooth. A small cavity was then prepared in the tooth lingually, and a 22 gauge iridioplatinum pin cemented in



Fig. 10.



Fig. 11.



Fig. 12.



Fig. 13.



Fig. 14.

the cavity, forming a hook of the exposed end. Molar bands were placed on the maxillary first molars with a lingual arch, and an extension spring wire of 22 gauge soldered to the lingual arch at one end, forming a loop of the detached end, and by springing the extension wire occlusally and labially, and ligating it to the pin that is cemented in the impacted tooth, the central is being forced into position, liberating the canine, which is also erupting. Fig. 9 also shows appliances in position.

Figs. 10 and 11 show impacted superior canines being treated in the same manner.

Fig. 12 shows case of an impacted canine forcing the lateral out of position. The lateral being very loose and in supraocclusion, and the root absorbed, a wire

ligature was placed on the anterior teeth, forming a support to the lateral, as shown in Fig. 13. The same treatment was applied as in Fig. 9. After the canine was carried into position and the pressure relieved on the lateral, the splint was removed and the tooth resumed its normal position and tightened. The patient is between six and seven years of age only. This case will be kept under close observation with the use of the x-ray.

Fig. 14 shows canine and lateral in position.



Fig. 15.



Fig. 16.



Fig. 17.



Fig. 18.



Fig. 19.



Fig. 20.

Figs. 15 and 16 show a case of two supernumerary teeth, and an impacted central incisor. The supernumerary teeth were removed, and a lingual arch placed in position, attached to molar bands. A lug was soldered to the lingual arch resting against the central, keeping the median line established, until the impacted central erupted, which was carried into position by ligating it to the lingual arch.

Fig. 17 shows the same case before treatment.

Fig. 18 shows impacted central erupting.

Fig. 19 shows completed case with sufficient space for the erupting canine.

Fig. 20 shows a case of an impacted mandibular second premolar.

Place molar bands and a lingual arch in position with a lug soldered to the arch opposite the canine. A band with a tube or hook attached was placed on the first premolar, which was ligated to the arch for the purpose of moving the premolar mesially, thereby gaining space for the impacted premolar. The anterior teeth were ligated to the arch, and the wire stretcher used in the premolar region to gain space also.

Fig. 21 shows the progress of the case with the second premolar erupting.

Fig. 22 shows an impacted second deciduous inferior molar. Patient, seven years of age, had suffered for some time with earache. The arch was undeveloped. The first permanent molar could not erupt and only the point of the mesio-buccal cusp of the deciduous molar was exposed. The premolar is deflected distally.



Fig. 21.



Fig. 22.



Fig. 23.



Fig. 24.

The gum was removed from the crown of the deciduous molar and allowed to heal. A crown was made to fit the corresponding second deciduous molar which was fully erupted. Lingual and buccal half-round tubes were soldered to the crown, which was cemented to the impacted molar. A cast splint of coin silver was made to fit the incisors, canine and first molar, with wires of 22-gauge iridioplatinum soldered to the lingual and labial surfaces. The splint was placed in position. The wires were bent occlusally and placed in the half-round tubes of the crown on the impacted deciduous molar, which elevated or caused the tooth to erupt, and the arch developed interstitially.

Fig. 23 shows development of the arch, and the first permanent molar in position and the premolar erupting normally.

Fig. 24 shows the appliance.

DISCUSSION

Dr. Wm. A. McCarter, Topeka, Kansas.—Dr. Richardson has given us some practical ideas of some of the conditions that we have to deal with in our practice. I have had a few cases which almost parallel those she has reported and has shown slides of, and I have had the usual trouble, I suppose, in getting the teeth to their proper position. At least, I suppose it is trouble; it is with me, and if the rest of you can get along so well with these cases I would like to know how it is done. This is particularly true with reference to the short incisors that have caused a great deal of trouble. I have undertaken to pull them down, and as they are almost always accompanied by a short upper lip it is very distressing if you undertake to lengthen them too much.

I am treating a case now similar to the one Dr. Richardson spoke of toward the



Fig. A.



Fig. B.

latter part of her paper. I shall describe the case I have under treatment. When it was time for the eruption of the second temporary molar it seemed not to erupt at all; it came to the surface, showing the occlusal surface, and it seemed not to grow any more and there was quite a space. There was no occlusion at all in the temporary teeth. When the first molar came in it tipped forward quite a distance, and the x-ray showed the tooth perfectly formed, and not only that, but the premolar was well formed. I put on a band and spring appliance to tip the first molar back, and I am getting results. Another case I wish to speak of in connection with infraocclusion was complicated with a rather undeveloped condition of the mandible, where the incisors were so long that they reached up into the roof of the mouth and were touching the gum quite a distance back of the upper incisors. This caused a great deal of trouble.

I think I have a lantern slide of that case that I shall show. (Fig. A.) This case, you see, has a very much undeveloped mandible with impaction of the premolars. The lower central incisors were reaching up into the roof of the mouth and making indentations in the palate. In bringing them forward to develop the mandible I found a considerable shortage of premolars; when they came in they had to be elongated.

Fig. B shows a difference in the size. It shows the relative size of the upper and lower arches.

Fig. C shows the result I finally got.

In doing this thing and using ordinary expansion of the arch, I put considerable stress on the premolars and raised them after they ceased to erupt of their own accord, and this illustration (Fig. C). shows the occlusion obtained. That is the result of the case after it was completed. As you can imagine from the looks of the first picture, there was a short mandible, and a very much undeveloped condition.

Speaking of impactions, I had one case of impaction that came under my treatment (Fig. D). In this case the treatment was begun by Dr. A. C. Smith, of Pasadena, California, who just got the case started, and the patient moved to our town and fell into my hands. I treated the case with the result shown in Fig. E. That is the little experience I have had with infraocclusion, and my treatment has been in accordance with the best method known to me of handling the case.

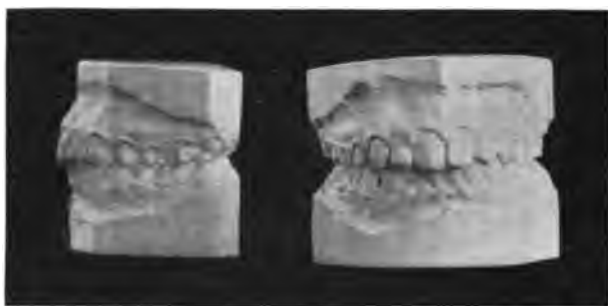


Fig. C.



Fig. D.

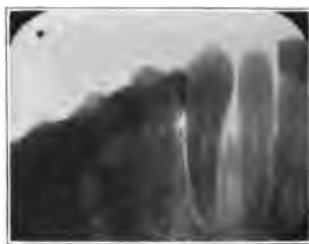


Fig. E.

I should like to hear some one discuss this subject who has a more scientific way of handling these cases than I have.

Dr. H. A. Pullen, Buffalo, New York.—I have not very much to say on this paper, although I enjoyed it very much.

I have had quite a number of cases of impaction from time to time, and have a case on hand at the present time. The last one I had came from out of town. The patient was a young lady who was very much frightened for fear she had to undergo a serious operation, that is, cutting through the palatal surface of the dental arch to get at a canine tooth which was impacted. The operation was simple and did not require a general anesthetic. I believe she was given a general anesthetic when it was first attempted in another city. She complained about it, and when she fell into my hands I could hardly get her to open her mouth to get at the gum tissue and get under to the tooth substance to put a pin in the tooth.

Most of the difficult cases we have to deal with are found in the palatal surfaces of the dental arch—canines. The use of the lingual arch is a new phase of the operation. In

many of the cases the appliance does not show, and many of these cases are in patients of an age where the individual dislikes very much to have an appliance that is conspicuous. For instance, in the case of impacted canines there will be a good many years before the tooth is drawn out. I have used both lingual and labial arches for the basal attachment or apparatus to draw down the tooth in that position, and in addition using a lingual spring attached lingually or labially, or I attach a silk ligature, and later on use an elastic rubber ligature.

The operation of cutting down on the tooth is a very simple one, and those who have not tried it need not be afraid of it, unless they find from their radiographic diagnosis that the tooth is deeply impacted and may necessitate the aid of an oral surgeon to assist in getting down on the surface of the tooth itself. If, as is usually the case, the tooth is a slight distance below the gum, with a slight covering of bone, it only necessitates a local anesthetic, in order to make the tissues sufficiently anesthetized so as not to give pain in cutting down to the tooth. There is no pain over the canine, and one can put in a tampon of cotton, leave it overnight, and see the patient the next day, and then carefully locate the point at which you want the arch, or the tooth you want to locate with a plan for attachment from that tooth to the basal anchorage. It is unnecessary to cement the pin in position. The hole, as drilled in the portion of the tooth, is away from the dental pulp, it can be turned inward, having made the pin in a hook form, it will be in there so tight that it will stay during the entire operation without cementation. Cementation is really the most difficult part of the whole operation.

Dr. H. C. Pollock, St. Louis, Mo.—A point in regard to impacted teeth, particularly canine impactions. We find in many instances, canine teeth to be impacted and in contradiction to the remarks made by Dr. Pullen, these teeth do not appear most commonly above the surface of the compact bone, but are encased in a cyst-like shell of compact bone, not unlike a pea is held in a pod; and when this shell is penetrated with a bur or sharp instrument, the bone dissects off easily and breaks away, making the impacted member easily accessible for any operation it is seen fit to do on it.

Another point in this discussion; that is, the use of the Steeles replaceable facing kit which may be sometimes utilized to very good advantage in the handling of these impactions. As you know, this kit is equipped with a chisel bur which may be employed to drill the hole through the enamel of the tooth. There is also a threaded male die of the exact size of the chisel bur which may then be utilized to thread the hole through the enamel and on into the dentine. After this is completed, the small gold screws which come with the outfit then exactly fit and may be screwed into this hole with the small miniature screw driver which is a part of this kit. After finding that the screw will twist into the hole made in the impacted member, any attachment desired may be soldered onto the head of the screw, then cemented into place.

Dr. George F. Burke, Detroit, Mich.—I would like to ask Dr. Pullen what sort of wire he uses to insert in these impacted cuspids, whether he makes it himself, or is it something that can be purchased from the supply houses?

Dr. H. A. Pullen.—I usually make the wire myself, a little larger than the diameter of the hole drilled in the tooth, then thread it and make it taut. Be sure it fits tightly in the hole, and turn it in so that it will not come out. The use of wire of small diameter is not conspicuous and does not interfere with occlusion or anything like that. One must be sure that the wire or thread does not slip when it is in position.

Dr. E. G. Weeks, Saginaw, Mich.—I can show you a number of x-ray pictures where there is a sac, you might say, around the bony portion of the canine which is very hard just before you break into the conical portion of the canine. I have seen these sacs extending across a portion of the canine where the tooth was retained for a long time. In one patient I have in mind, thirty-eight years of age, the sac extended over half the way up the length of the canine. I have cut through that and I find the bone is very compact. It is hard. It is like a shell.

I have a kit from the Blue Island Company, and have had no difficulty with it. If the thread on the pin wears off before you can get it to stick, if you take a little tap you can

thread the tooth and cut the wire with the same thread you have on your tap. I put cement on the pin. If it takes a long time to fit the tooth, it will take a corresponding length of time to get it out. You are more or less apt to have decay of a portion of the tooth occurring before you get the tooth down into place without cement even though the pin is threaded and tooth threaded. I have presented that and mentioned it in connection with the discussion of Dr. Simpson's paper. I have lantern slides to show the method of technic of making a hole in the tooth, threading the tooth, and threading of the pin, etc.

Dr. H. A. Pullen.—The last case I mentioned came from a very dear friend of mine out of town. In his third attempt at operation he could not locate the surface of the cuspid, although he had opened through the tissue. He drilled a hole into the cuspid and it took me half an hour to locate where he drilled the hole. He drilled beside the cuspid in the bone. He put a pin in there which lasted forty-eight hours. That is not an infrequent occurrence. If the tissues have not been opened wide enough, a tampon of cotton will spread them apart so that one can see what he is operating on.

In studying radiograms I locate exactly the surface on which I am operating. If you are drilling into the enamel you have to have a diamond-pointed drill, a brand new drill, or a small pointed bur until you get the initial opening through the enamel itself; then everything goes smoothly.

Dr. W. E. Lundy, Memphis, Tenn.—This subject we are discussing is of very great interest to me. I have had a little experience with some of these cases and have had some trouble with them.

I would like to ask whether any of you have had any experience with the method of Dr. Crawford, of Nashville, in regard to tapping. He simply makes an opening into the tooth and by putting an instrument against it produces irritation by tapping the instrument with his mallet. That method frequently brings about results. In one or two cases I have succeeded in getting the tooth to grow after that plan without putting anything else on it.

What experience have you had in cases of that sort?

Dr. Pullen.—How long did you wait before tapping?

Dr. Lundy.—In the cases I had, possibly six or eight months. As I recall now, I had two cases in which the teeth grew in about that time. I extracted a temporary canine that had been retained, and there was no indication of the tooth coming at that time, and when I found it in there, I started by setting up this irritation.

Dr. Burke.—What was the age of the patients?

Dr. Lundy.—Both of them were adults; I don't remember their age exactly, but there was room enough for the tooth to come in provided the temporary canine had been removed.

A MODEL TRIMMER

BY B. HOLLY BROADBENT, D.D.S., CLEVELAND, OHIO

THE accompanying pictures show the use of a wood trimmer for finishing plaster models. This was suggested by Mr. Charles Arnold, a student at East High School of Cleveland, who designed a machine which approached this wood trimmer very closely.

Aside from a few slight changes, the outline of the models is that worked out by Dr. Martin Dewey. Fig. 1 shows a lower model in position for the first cutting—trimming the base line (*B*) at right angles to the median line (*M*). The first cuts taken may be very thick if the plaster is not too dry, and as the desired line is neared, it may be reached by removing thin shavings. This avoids chipping the



Fig. 1.

margins and makes a smooth-finished surface. The next picture (Fig. 2) shows how the gauge gates may be set and the sides of the model trimmed parallel to the buccal surfaces of the premolars and molars. Thus, the front and corners may likewise be finished. In this case, the front of this lower model was cut straight across, but if a curved front is desired, the bulk of the plaster can be removed by the machine and the curve finished by hand.

Now the upper model may be occluded with its lower and so held in the machine as to trim off the posterior surface (*UB*-Fig. 3), until it is in the same plane as that of the lower (*LB*-Fig. 3). This plane will indicate the proper occlusion of the teeth and avoid the marking of the anatomic portion of the models. With the models still occluded they may be held in the position shown in Fig. 4, keeping the bottom of the lower model (*L*) in a plane parallel to the cutting plane of the blade, so that the top of the upper model may be made parallel to the bottom of the lower. This will be made easier if the gauge gate is placed at 90° and the bed of the machine marked with a number of lines parallel to the blade (see Fig. 4). The front of the upper may now be trimmed from the median line

back to a point over each canine, the angles with the median line depending on the shape of the arch. Trimming a small bevel around the periphery of the upper as shown in Figure 5 gives the whole a more artistic finished appearance. This may be done easily with a knife.

The machine shown has been used nearly six months by Dr. W. E. Newell and has needed no attention, except the removing of the plaster from the



Fig. 2.

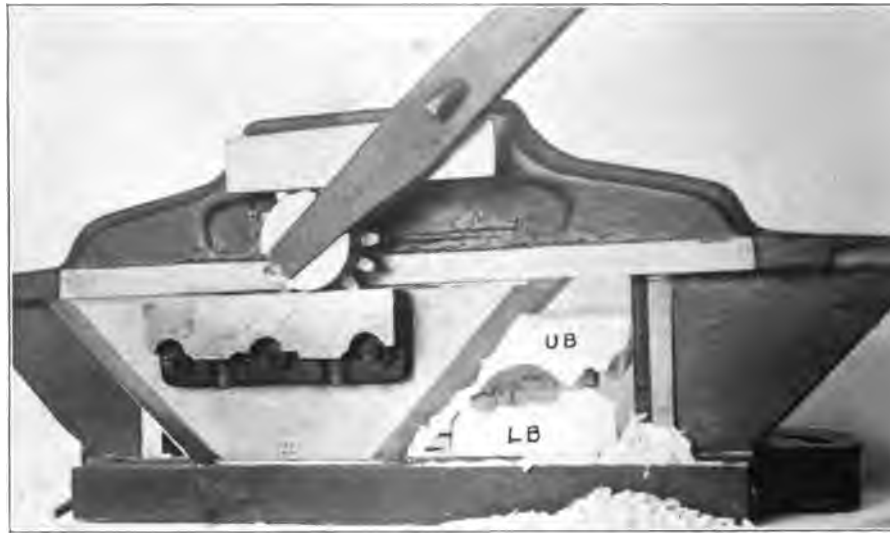


Fig. 3.

and the other unpainted surfaces after each day's use. It has been wisely suggested that all rusting might easily be prevented by nickel plating the exposed surfaces, except the cutting edge of the blade. This machine has already paid for itself many times over, in time and labor, and requires no special ability to operate. A set of models can be finished in ten minutes and most of the annoying task of handling plaster eliminated.



Fig. 4.



Fig. 5.

HISTORY OF ORTHODONTIA

(Continued from page 92.)

BY BERNHARD WOLF WEINBERGER, D.D.S., NEW YORK CITY.

VICTOR HUGO JACKSON, M.A., M.D., D.D.S. In 1887 before the *New York Odontological Society*, Jackson presented a simple wire device for the regulation of teeth, which he termed a *crib*. Although he had used other apparatus prior to this time, and appliances similar in design had been used, this term is now associated with Dr. Jackson's name and that type of appliance has become known as the *Jackson crib*. (Fig. 1.)



Fig. 1.—Dr. Victor Hugo Jackson.

The "crib" is designed as an anchorage attachment for plates of various kinds, "this anchorage was gained by extending a spring wire on the lingual and labial sides of the teeth near the gums, in some cases including all of the teeth, in others only a part of the arch; the spring in the labial and lingual sides was connected by passing wires over the arch at the junction of the teeth. Later I [Jackson] devised the Jackson System. The anchorage is secured by spring-clasp attachments and partial-clasps, supporting a base-wire, to which any form of spring can be added." [Preface to *Orthodontia and Orthopaedia of the Face*. (1904.)]

(Copyright, 1920, By Bernhard Wolf Weinberger)

In appearance Jackson's crib resembles the devices of Delabarre, Schanage, Evans, Lachaise and Atkinson, although these were used principally to open the bite.

The following are the claims made of the system.

1. Ease of construction and alteration.
2. Firm anchorage.
3. Occupation of little space in the mouth.
4. Cleanliness.

Dr. Jackson was one of the early advocates of continuous pressure in preference to intermittent force as brought forth by Dr. Farrar.

Some Methods in Regulating, Dental Cosmos, page 372, 1887:

"It is my custom, before choosing the method to be pursued, to prepare models of the upper and lower teeth, that their articulation and the position of those to be moved can be more fully apprehended and the models preserved for future reference. The method that will cause the least pain and inconvenience to the patient, the least injury to the teeth and surrounding structures, interfere least with articulation and move the teeth to the position desired in the shortest time, should be adopted.

"I believe that as dentists and members of societies we should deal more with practical cases, and not speak so much as is common from a theoretical standpoint, if we wish best to assist our fellow dentists. With this feeling I have brought before you this evening several models illustrating the position of the teeth before and after regulating. The appliances used in these special cases, both for moving the teeth and to retain them in position, are also shown.

"As the models are examined, it will be seen that the arch was first spread by a plate described, and then wooden pins so inserted as to force the lateral forward toward the central. Later the pins were so changed in position as to send the tooth outward.

"The plate was inserted April 22, and taken out July 10, the teeth then being in proper position, although not fully erupted. A retaining wire, after the idea suggested, I think in this society, several years ago by Dr. Atkinson, was used very successfully, and worn until September 15, when the patient was discharged. Dr. Atkinson recommended half-round wire for retaining. I use round platinum and iridium wire, forming it upon a plaster model, by starting on the palatal surface of the molars, and following the line of the gum; bending the wire sharply, with the fingers or the clasp-benders, to such form as will best clasp the necks of the teeth. It can be extended around the entire arch to the place of beginning, or pass over at any place the articulation will permit. Short pieces of the same material can be passed between the teeth or over certain cusps to stiffen the appliance and to keep it from riding on the gum. These pieces should be soldered with pure gold. If necessary to connect between the front teeth to stiffen the remaining wire, slots should be punched in the ends of a narrow piece of thin platinum plate to receive the wire, and pure gold flowed over all. I have found this a most valuable retaining appliance, and after a little experience it can be used in a majority of cases. It can well be called a

crib, and used in a great variety of forms. It was used successfully to retain a right superior central that had been drawn back from a very prominent position where it had overlapped the left central. A crib was made to fit over and around the bicusps on the left side, from which a wire was extended along the palatal surface of the teeth to the space between the centrals through which the flattened wire passed and hooked around the right central. It could be displaced and cleaned by the patient, and there was nothing in sight but the slight end of the hook. It takes but a few minutes to construct such an appliance. The same method can be used for the attachment of cords or rubber rings, where traction is needed toward the distal part of the mouth, the crib being made to extend over two or more teeth as the case requires, and a hook formed at one side at any angle desired to make proper tension."

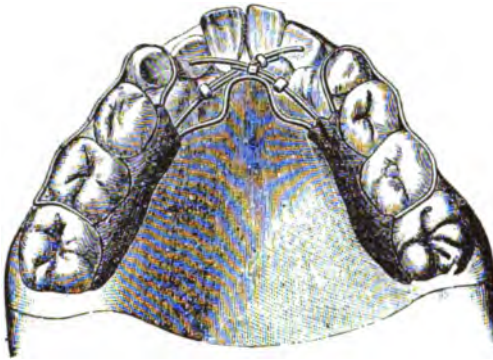


Fig. 2.

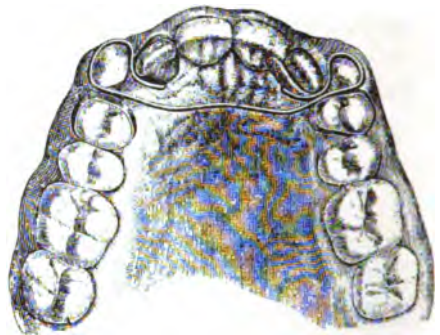


Fig. 3.

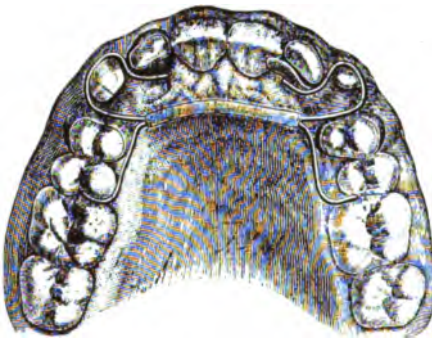


Fig. 4.

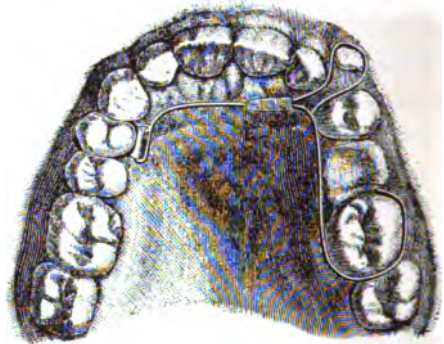


Fig. 5.

One of the appliances described by Jackson is shown in Fig. 2, and is the retaining wire as applied and worn for several months.

Before the *American Dental Association*, 1889, under *Some Methods of Regulating Teeth*, Jackson goes into greater detail concerning his system. Figs. 3, 4, 5, and 6 illustrate the method he then used.

Correcting Irregularities of the Teeth is the title of a paper given by Jackson before the *International Medical Congress* at Berlin, 1890.

(*Dental Cosmos*, 1890, page 877.) "Orthodontia will no doubt eventually become a distinct specialty of dentistry, but it is necessary at present for the general practitioner to be more or less familiar with the systems in use, in order

that he may choose that which will be the most effective in a given case and require the least outlay in construction. It is my purpose in this brief paper to describe and demonstrate with models and apparatus some methods of applying removable springs without the use of a plate for regulating teeth, describing methods that I am using daily, and with which I have attained good results in a limited time, and in passing I desire to express a growing confidence in the use of the removable spring in moving teeth. Piano wire is at present the best spring for the purpose, although spring gold, silver, and German silver are often applicable, especially if the temper is not drawn while soldering, and that can be avoided in some cases by keeping the spring portion cool or by using soft solder, which is usually preferable."

The crib as described in this paper was made "for each side of the arch, to encircle all of the teeth back of the incisors; a slight separation was made by wedging in front of the cuspids, and a round iridio-platinum wire was flattened to pass into the space on either side, and extended back following the line of the gum and surrounding the cuspid, bicuspid, and molars. This was supported and made to more firmly clasp the teeth by making cross-bars to connect the two

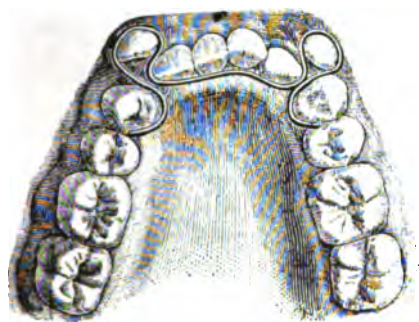


Fig. 6.



Fig. 7.

sides of the crib by passing over the articulating surface at the junction of the teeth, serving also to keep the crib from pressing on the gum.

"There was a loop soldered to the crib-wire opposite the palatal surface of the first molar on each side of the arch, into which loop was hooked the end of a piano wire formed like the letter *S* and extended forward, passing just back of and following the curve of the incisors. There were placed on the incisors gold collars with lugs soldered on their palatal surfaces, to hold that portion of the spring in position. Fig. 7 shows the device in place on the four incisors in another completed case of the same character.

"Pressure was made as needed, by straightening the *S* loops of the spring wire a little at a time.

"The incisors were moved rapidly, and when sufficiently forward, the portion of the crib in front of the cuspids was removed, and a piece of piano wire was soldered to the original spring wire, which extended to the distal sides of the cuspids, by the application of which they also were moved forward. Another spring was then attached by solder to the original one, as before, to move the cuspids forward, and at the same time one of the cuspids was prepared to

be rotated by placing on it a collar, with a cylinder soldered to its palatal surface, to hold a spring which extended to the opposite side of the arch and hooked into the loop in the crib.

Figs. 8, 9, 10, 11, and 12 illustrate some of the various devices shown before that Congress. In a case of protrusion of the mandible Jackson presented the following method:

"A split plate (Fig. 13) was made as described by Dr. W. H. Coffin, of England, except that it did not cover the teeth or open the bite. It was strongly retained by two wire clasps extending from either side to clasp a bicuspid and molar. The plate was divided laterally, leaving the anterior part sufficiently



Fig. 8.



Fig. 9.

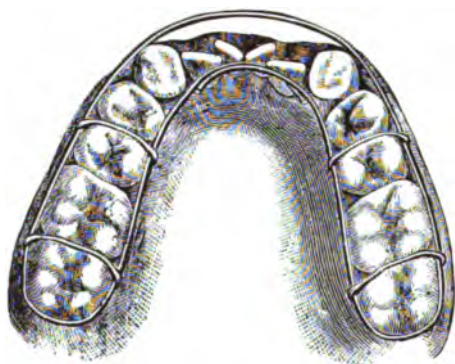


Fig. 10.



Fig. 11.

large to cover the intermaxillary portion of the process for the purpose of forcing it forward with the teeth. Collars of gold, with lugs on their lingual surfaces, were placed on the incisors, and firmly retained the anterior part of the plate.

"When the incisors were moved as far forward as practicable the appliance shown in Fig. 14 was made and adjusted, as seen in Fig. 15."

Methods of Regulating Teeth, Cosmos, 1891, page 1067:

"It is not the present intention to enter into a discussion of the reasons for advocating early regulating, as that is not the purpose of this paper, which leaves the question for consideration at another time.

"It is, however, the opinion of the writer that each tooth should be encouraged to take a correct position in the circle of the arch while erupting (or as soon thereafter as practicable), in order to promote the proper development of the jaw, for the teeth next to be erupted are thus more likely to do so in proper position and order. Only a portion of the alveolar process that forms the sockets for the roots of the teeth is developed until the teeth are fully erupted. For this reason a slight pressure will change their position.

"When convinced of the advisability of regulating teeth for young patients, several devices have been adopted with partial satisfaction, but none as yet have met all the requirements so perfectly as the 'crib,' which is equally applicable to patients of every age.

"The common and reckless extraction of temporary and permanent teeth to relieve crowding should be discouraged, and in preference, when necessary, an appliance be made for spreading either the superior or inferior arch.

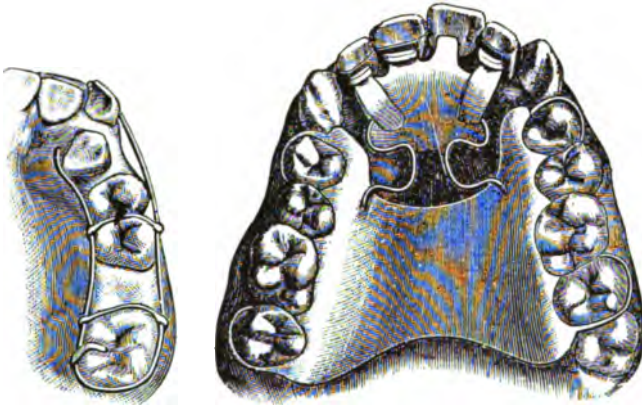


Fig. 12.

Fig. 13.

"If there is insufficient room for the free eruption of the permanent teeth, it is best to begin to expand the arch, if necessary, when the incisors are erupting, an operation easily accomplished by means of the crib appliances.

"The advantage of using the crib appliance for young patients is that it is easily retained, causes no inconvenience, and does not interfere with articulation, even when used in the upper and lower arches at the same time.

"By attaching the appliance to a single tooth on each side of the arch as an anchor, all of the other teeth tend to support it, and thus, in ordinary cases, the same object is gained as when more teeth are used as anchorages.

"If the arch is much crowded and some of the teeth too prominent or requiring to be rotated while at the same time expanding the arch, an appliance like Fig. 16 will often be required, and in addition to the appliance described a base wire should be anchored either to the second temporary molar, second bicuspid, or first permanent molar on each side of the arch, and provided with one or two loops or corrugations, just anterior to the crib attachments. The loop-shaped spring is then united to the base wire by one of the methods previously described. To expand the arch, the loops or corrugations in the base wire

are opened slightly from time to time, and the loop in the spring over the incisors changed to meet the indications.

"If the lower incisors are crowded, and especially if they are held back by the position of the superior incisors, and their position is such as to require whole or part of the arch to be expanded, an appliance like the one shown in many cases, meet the requirements. The base wire in this instance is fixed with a loop in the center just posterior to the central incisors, and anchored to a tooth on each side of the arch as described. A spring is then attached to



Fig. 14.



Fig. 15.

base wire just anterior to the crib portion on each side in the usual manner, and extended forward to the lingual surface of the teeth to be moved. A collar is placed over the wire and a lug is often placed on an incisor or other tooth to steady the spring. The pressure is controlled by opening the loop and bending the springs outward. Figure 15 exemplifies the method employed to force into line a left superior lateral incisor that was far inside the arch and out of proper position. At the same time the upper arch was to be spread to some extent. A crib was formed about the first premolar on each side of the arch, and to the crib was soldered a base wire that was shaped to the curve of the lingual surface of the teeth. A spring was

fastened to the base wire near the right bicuspid and extended forward, forming a spring which passed beneath a lug soldered to a collar on the lateral. The same system was employed to move a central incisor out into line, the crib being attached to the temporary molar. In each case the teeth were moved into position in a very limited time.

"In Fig. 18 it will be seen that the right superior incisor is too prominent and the left incisor not prominent enough, and is partially rotated. The irregularity was corrected by making a crib with which to clasp the second right superior temporary molar. A spring extended from the crib to the front of the



Fig. 16.



Fig. 17.



Fig. 18.



Fig. 19.

arch, following the labial surface of the teeth near the gum line, and was formed to pass the right incisor and to extend into a tube soldered to a collar placed on the left incisor.

"Fig. 19 shows a very convenient method of regulating the V-shaped arch, by forming a base wire (with or without a loop or corrugation), which is shaped to the lingual side of the teeth, and anchored to one or more teeth on either side by a crib, to the labial side of which should be attached a hook or eyelet to sustain a straight bar of spring wire that is sprung over the front of the teeth for the purpose of flattening the shape of the arch. The tendency of the wire to straighten itself exerts a pressure backward on the front teeth, and at the same time assists in spreading the arch.

"Respecting this entire crib and spring wire system, special stress is laid on the following facts: (A) The materials—piano wire, Tagger's tin, sheet copper, copper wire, tin and soft solder—are inexpensive, and within the reach of all. (B) The crib and spring construction is simple and quickly done. (C) The clinging grip of the crib on its anchorage is sufficient to hold the fixture firmly, yet it is easily sprung off for cleansing or change. (D) Changes or additions are easily and quickly made. (E) The structure is light, cleanly, and occupies the least possible space in the mouth. (F) Its action is controllable, and free from risk of overaction. (G) It forms a perfect retainer." The following are a few of the appliances used by Jackson at the time (Figs. 20 and 21):

At the *World's Columbia Dental Congress*, 1893, the following paper was read: *Method of Constructing Spring Appliance for Correcting Irregularities of the Teeth*. Most of the principles used in this paper have already been shown. In conclusion Jackson replied, "Before I conclude, let me recapitulate what I consider the indispensable advantages of the system I have described:



Fig. 20.



Fig. 21.

"First. It does away with plates covering the roof of the mouth.

"Second. Although the anchorage is sufficiently firm for all practical purposes, the appliance may readily be removed by the patient. An aid to cleanliness.

"Third. The materials, German silver, Tagger's tin, piano and German silver wire, and soft solder, are cheap and easily obtained.

"Fourth. The crib and spring construction is simple and quickly prepared, and changes and additions are easily made.

"Fifth. The appliance requires less attention than those ordinarily used, and thus there is a saving of time.

"Sixth. Many of the springs described can be utilized to advantage in combination with a rubber or metal plate.

"Seventh. The whole or part of the appliance can be made of precious metals if desired.

"I freely give the results of my study to the profession.

"Beyond copyrighting this paper I reserve no exclusive rights in the sys-

tem to which I have devoted years of thought and labor. I need not rehearse to this audience the perplexities and unforeseen obstacles which are at once the bane and the fascination of scientific research.

"How far I have succeeded in conquering the difficulties in my path let others judge. The story of man's contest with the forces of nature is as old as the world. No one is more familiar with it than the members of our profession, who work to relieve their fellow beings of the consequences sometimes of misfortune, sometimes of folly.

"But though no letters patent protect me in the material advantages of my method, I am not without a great reward; I shall find it in the knowledge that I have in a manner aided the work to which we give the best part of our lives: the best product of our knowledge. If my professional brothers find the system I have outlined a help in their practice and a step along the road of progress, I am amply repaid for what I have done.

The following illustrations are taken from various papers and need no explanations.

In 1904 Dr. Jackson brought all of his material that had been published in various journals together and published his book entitled: *Orthodontia and Orthopaedia of the Face*. Under *Bodily Tooth Movement*, page 309, he says:

"Early in practice I moved the incisor teeth bodily, both anteriorly and posteriorly, without changing their angle. [See *Dental Cosmos*, 1887, page 385, and 1888, page 512.] Dr. Jackson: "At some future time I will describe my method of carrying the incisors forward bodily without changing their angle." *Cosmos*, 1887. Dr. Jackson: "I expected to present here today a method of carrying front teeth forward and retaining them in position. I believe that teeth can be moved bodily without injuring to any great extent their pulps. I have succeeded in carrying them to some distance. I have caused the death of pulps by carrying the teeth too great a distance, and too rapidly, however. We must consider when the lower arch is much larger than the upper, there has been from some cause an arrest of development in the upper. How does this upper jaw expand and enlarge? It is by the growth of the palatal bones from the edges, as well as by the interstitial growth spoken of by Wedl; and if we begin the regulating early in life we encourage that deposit which is necessary to enlarge the upper arch to the required size, or comparative size, of the lower one." *Cosmos*, 1888.

"In but a small percentage of the cases presented for treatment requiring the incisors to be moved outward or inward is it found necessary to adapt special apparatus and move them bodily, and again but a few of the cases that are so treated meet the full expectations of the operator, especially when the operation is performed upon an adult. After the teeth and bone have been moved, in the healing process there is always a contraction similar to the contraction of scar tissue after a wound; and if an ordinary retainer is applied which does not hold the teeth bodily, this condition will force the roots of the teeth towards their original position, which gives an unpleasant appearance of their crowns. Mov-

ing all of the incisors outward at any time by force applied to their crowns carries more or less of the alveolar process with them, particularly the outer table. With young patients the stretching of the premaxillary bone encourages its development. The suture between the premaxillary and the palatal processes of the maxillary bones is not fully united in early childhood. Flat bones grow from their edges. The premaxillary may be numbered with this class; during its development it can be encouraged by pressure to take on a different form, and therefore better results are obtained if the change is made while alveolar process and jaws are in this active stage of development. In any case, the continued retention of the teeth in their new position for a considerable length of time, to permit the process to become firm around them, is essential. This is sometimes difficult to accomplish while the bones and process are still developing and before the bicuspid are fully erupted. Space for the accommodation of the permanent cuspids should be constantly preserved. If the deciduous cuspids are absent, with insufficient room for the permanent ones at about the time of their eruption, the case should be carefully examined to determine whether the roots of the lateral incisors are sufficiently in front of the incoming cuspids to permit the latter to take a correct position. The roots of the lateral incisors are somewhat flattened laterally, and they should be located so that the incoming cuspids will not rotate them. These precautions are necessary when the anterior region of the upper arch is not sufficiently prominent to harmonize the features. It is difficult sometimes to determine fully before the tenth or twelfth year how the jaws are going to harmonize as to their fullness, and when the deformity is not very marked it is usually advisable to defer operating until a satisfactory diagnosis can be made.

"Outward Bodily Movement of Incisors.—The first appliance that I devised for moving the teeth bodily outward was made for improving the position of four upper incisors. A metal cap of No. 28 gauge, made with accurate metal dies, was attached to the incisors. To the lingual side of the cap near the gum were soldered two heavy wire arms, extending backward and following the inner curve of the arch, one on either side, near the bicuspid and molars. Holes were made in the labial and lingual sides of the cap, in position to accommodate wire ligatures passing between the teeth near the margin of the gum. The cap was fastened to the teeth by first passing the ligatures between them and the holes in the edge of the cap, drying the teeth carefully, and setting the cap with cement, hastily drawing the ligatures up firmly and twisting their ends. The anchorage for moving the teeth was secured by shaping a partial vulcanite plate to the palatine arch, covering the arms described. In these places the plate was thickened, forming grooves, extending from front to back on the lingual side, for the accommodation of the arms.

"The plate was retained with wire-clasps passing around the first bicuspid and first molars. Each arm had a small projection or knob soldered to the side of it made long enough to project through the surface of the plate to engage with springs for supplying the force, the plate being dressed away in these

parts down to the grooves to expose the knobs, and to form a short slot in front of them to permit the movement. Two springs for this purpose, one on either side, were attached to the anterior third to the plate, and shaped to the double curve to extend back of and engage with the distal side of the knobs on the arms, thus giving the desired pressure forward.

"Several methods of making attachment to the teeth will be described. To the incisors a fixed attachment may be made with collars, soldering to them a heavy lingual base-wire, with the ends extending backward in the form of arms; or by arranging on the inner curve on each side of the arch a forked arm, one

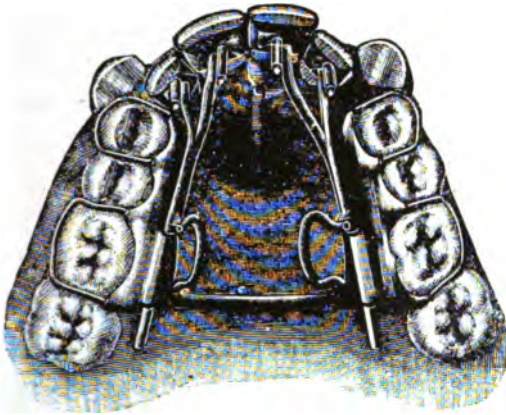


Fig. 22.

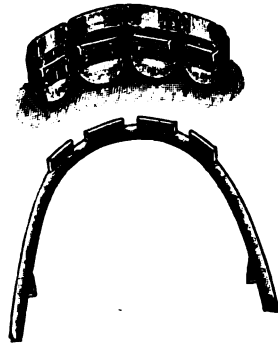


Fig. 23.

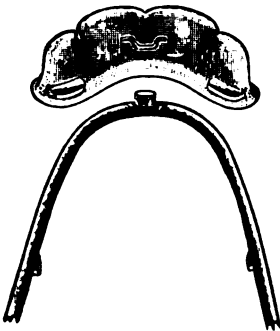


Fig. 24.

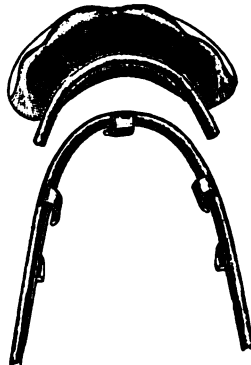


Fig. 25.



Fig. 26.

of the forks being soldered to a broad collar previously fitted to the central, and the other soldered to a similar collar on the lateral. With the arms forked in this manner, the collars are easily adjusted for cementing. The free ends of the arms project backward to be supported, and engage with springs in a plate in the manner mentioned; or force can be applied from a metal anchorage. To make the long arms removable for cleansing, etc., (Fig. 22), solder a strong short arm to the lingual side of each of the collars, or to a metal cap, the arms pointing backward parallel one with the other, to project into strong tubes at-

tached to a lingual base-wire, or to forked arms. The tubes, if required, should be a little larger in the mesio-distal diameter to allow for any side variation in the line of the posts, and to permit of easy removal. This connection can be made in the reverse manner by soldering the tubes to the collars, and the arms shaped to project into the tubes. The anchorage usually consists of spring-clasp attachments to the first bicuspsids and first molars, the sides being connected by a palatine base-wire. Each end of the base-wire, a tube, and one end of a U-shaped spring pointing towards the roof of the mouth, are soldered to the partial-clasps opposite the molars, the tubes being properly placed for the support of the arms. Each arm is provided with a flange to engage with the free end of the spring. Force is applied by bending the ends of the springs forward.

"Later the system of attachment of the arms to the teeth was simplified by soldering horizontally to the lingual side of each of the collars a small loop of flat or round metal, to engage with suitably shaped spurs projecting downward

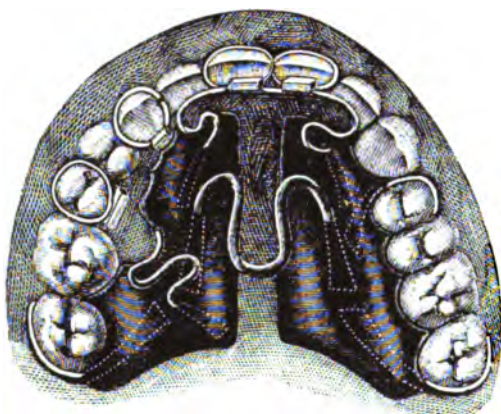


Fig. 27.—Jackson's modified split plate of vulcanite.



Fig. 28.—A device for moving forward a lower or upper molar.

and forward from the anterior part of a lingual base-wire. This attachment is in effect like a hinge that comes to a full stop when the distal part of the arm is pressed into place. It holds the teeth in the same relationship to the base-wire when force is applied, but it is easily unhooked for removal.

"This form of attachment is also available for moving the incisors bodily inward by reversing the hinged attachment to the base-wire arms, having the loops or eyelets near the necks of the teeth.

Fig. 23 illustrates another method of making an attachment on this principle. To each of the incisors to be moved is cemented a collar with a hook-shaped flange on the lingual side nearly as broad as the width of the tooth, and bent at a right angle towards the gum to engage with spurs projecting downward from a lingual base-wire.

"When the incisors are nearly in a line, cementing to them a swaged metal cap, covering all of the teeth to be moved, is sometimes preferable to the use of collars (Fig. 24).

"The base-wire is attached to the cap in an adjustable manner by soldering one or more loops to the lingual side of the cap to engage with spurs on a base-wire. One loop should be placed at the median line, and a shelf-like projection near each of the distal ends to support and hold the cap and bar in the same relationship as force is applied; or a short post may be soldered to the 'disto-lingual sides of the cap to engage with tubes on the base wire.

"Another method of making this connection is illustrated in Fig. 25. A large semicircular wire is soldered to the lingual side of the cap near the gum, with the end projecting a little. To a lingual base-wire of the same curve is attached one or more flanges that project upward and curve outward to engage



Fig. 29.—Expanding the posterior region on one side.

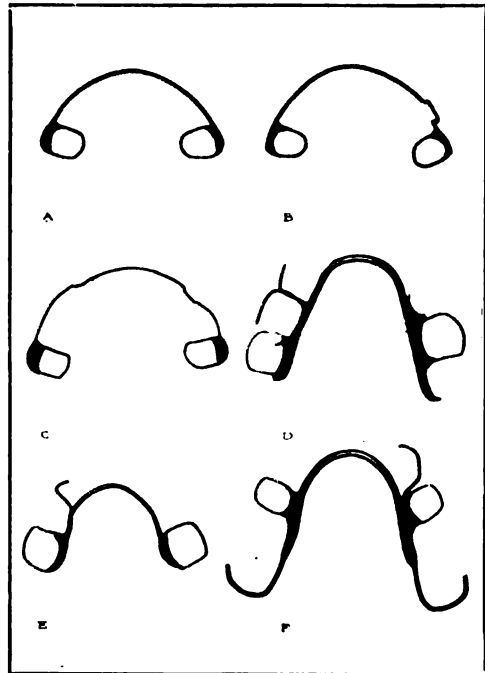


Fig. 30.—Jackson's retaining appliance. (Plate 34, Jackson's Orthodontia.)

with the upper surface of the semicircular wire attached to the cap, the base wire being removable as described. As force is applied, the flanges lock with the semicircular wire on the cap.

"Several variations from these forms of attachment have been devised. One that has proved convenient is made by soldering two horizontal planes to the lingual side of a cap, as illustrated in Fig. 26. The planes are formed of two pieces of plate-metal cut on a curve, the space between the planes being just sufficient to pass either side of the base-wire."

Dr. Jackson has read various papers before nearly all the prominent dental societies of this country and Europe, but as the principles of his methods are the same, it will be impossible to review all of them in this work, especially as this work extends only to the period of 1900.

VARIATIONS IN POSITION OF THE TEETH IN NEW WORLD MONKEYS*

BY J. F. COLYER, F.R.C.S., L.D.S.

IN a paper published in the *Dental Record* (January, 1914) attention was drawn to several specimens illustrating variations in position of the teeth in monkeys. Since the appearance of that paper a systematic examination has been made of monkeys in the British Museum, in the Royal College of Surgeons, and in a private collection. The British Museum furnished by far the largest number of specimens, and these with but few exceptions are from animals in the wild state. In all, just over 1,500 specimens have been examined, and the facts gathered are, I think, of sufficient interest to warrant their publication. It is, however, impossible to do justice to the subject in one paper, and I propose tonight to limit my remarks to the monkeys of the New World, which are divided by zoologists into two families: (1) Cebidæ; (2) Hapalidæ. In all 629 adult specimens were examined, those specimens being classed as adult in which the dentition had reached the stage where the third molars and canines were partly erupted.

With these few preliminary remarks we may pass to a detailed account of the variations seen in the different genera.

FAMILY CEBIDÆ

Genus *Cebus* (the Sapajous or Capuchin Monkeys).

Specimens examined, 146.

The typical arch in *Cebus* is shown in Fig. 1. In the maxilla the teeth are placed slightly oblique to the line of the arch, and are arranged in a curve, the greatest convexity of which is in the region of the first molar; in the mandible there is a somewhat similar arrangement. The following variations were noted:

(a) Slight crowding of the incisors, two cases¹ being noted in the maxilla and two² in the mandible.

(b) Slight outward displacement of a right maxillary canine in a male *Cebus leucocephalus*.³

(c) Irregular arrangement of premolars. In *Cebus* the mandibular first premolar is frequently a little oblique to the line of the arch, the distal aspect of the tooth pointing inwards; in two specimens the obliquity was sufficiently marked to constitute a definite irregularity. In four specimens there was an irregular arrangement of the premolars; in one case, a male *Cebus hypoleucus*, Fig. 2, both the maxillary and mandibular premolars were crowded. In another specimen, a *Cebus apella*, Fig. 3, there was a definite irregularity of the maxillary left first premolar. In this specimen the canine had erupted slightly for-

*Read at a meeting of the Section of Odontology of the Royal Society of Medicine, held February 24, 1919.

Reprinted from British Journal of Dental Sciences, December, 1919, and January, 1920.

¹*Cebus apiculatus* (B.M. 10.11.10.1)*; *Cebus fatuellus peruanus* (B.M. 0.11.5.2).

*B.M., abbreviation for British Museum.

²*Cebus* unclassified (B.M. 8h); *Cebus hypoleucus* (R.C.S. Odonto Series).

³B.M. 44.1.18.32.

ward and external to the normal position. There was no evidence that the malposition of the premolar was due to persistence of a fragment of a deciduous molar. In two cases the mandibular premolars were crowded.

(d) In *Cebus* the third molars occlude either edge to edge or the maxillary teeth lie a little internal to the mandibular teeth. The latter condition may be exaggerated, and in four cases one or both of the maxillary teeth occluded well inside the mandibular teeth. In six specimens the second and third molars on one or both sides were placed internal to the arch (Fig. 4), three examples being met with in *Cebus apella*. In one specimen, Fig. 5, all the molars were placed slightly internal to the line of the premolars.

(e) In *Cebus* there would seem to be a tendency for the molars to be rotated. In the normal, as previously stated, the cheek teeth are placed slightly oblique to the line of the arch. This oblique position may be sufficiently increased to constitute a definite irregularity, as shown in Fig. 4. Here the third



Fig. 1.—Typical arch in *Cebus*.

molars are rotated so that the anterior external angles are brought in contact with the distal aspects of the second molars. In one specimen¹ the maxillary right second molar was distinctly rotated, this irregularity being associated with slight crowding of the incisors.

(f) In three specimens a curious "échelon" arrangement of the molars was present, the teeth being placed with the anterior-external angle slightly inwards as shown in Fig. 6.

(g) In the mandible the third molar is placed with the roots sloping backwards: this backward slope may be increased sufficiently to result in a forward tilting of the tooth. This irregularity was noted in two cases;² in one, shown in Fig. 7, both third molars were tilted and rotated inwards.

¹*Cebus fatuellus peruanus* (B.M. 0.11.5.2).

²*Cebus hypoleucus* (B.M. 4.7.6.2); *Cebus xanthocephalus* (B.M. 491).

(h) In four cases there was slight inferior protrusion, the mandibular incisors occluding in front of the maxillary teeth.

From the above it will be apparent that there is a wide range in the positions in position of the teeth in *Cebus*, the number of specimens showing this variation being thirty-six, the majority being in connection with the molar series.



Fig. 2.—*Cebus hypoleucus* (B.M. 2.3.5.15), from Coiba Island, W. of Panama. This specimen shows a general irregularity of the premolars.



Fig. 3.—*Cebus apella*, showing a misplaced maxillary left first premolar.



Fig. 4.—*Cebus hypoleucus* (B.M. 68.7.9.1). In this specimen the maxillary right second and third molars are placed internal to the line of the arch.



Fig. 5.—*Cebus* unclassified (B.M. 3.9.4.15). In this specimen all the molars are placed internal to the line of the premolars.

In addition to variations in position, five cases of absence of teeth were seen, and in twelve cases the mandibular first premolar was abnormally placed. These facts which seem to suggest that the genus *Cebus* is in a "changeful mood."

Genus *Lagothrix* (the Woolly Monkeys)

Specimens examined 29.

The Woolly monkeys, first described by von Humboldt, "take their name from the thick coat of woolly fur which is found beneath the longer hairs."

(1) In this genus five specimens exhibited an irregular arrangement of the premolars. In one, a *Lagothrix Humboldtii*, Fig. 8, there was a definite outward displacement of the maxillary left third premolar. In another specimen, Fig. 9, the maxillary left third premolar was rotated so that the external aspect looked backwards; on the opposite side of arch a space was present between the maxillary first molar and third premolar. In a third specimen a *Lagothrix infumatus*, Fig. 10, there was a definite asymmetry of the facial bones. On the right side (i) the maxillary canine rested in occlusion over the mandibular first and second premolars; (ii) there was crowding of the premolars; (iii) the third molar was misplaced with the occluding surface looking well backwards. There was a definite cross-bite of the incisors, the mandibular right incisors passing in front of the maxillary teeth. The general appearance of the bones suggested an arrest in growth of the right maxilla. Of the two remaining specimens showing irregularity of the premolars, in one,¹ the maxillary first premolars were

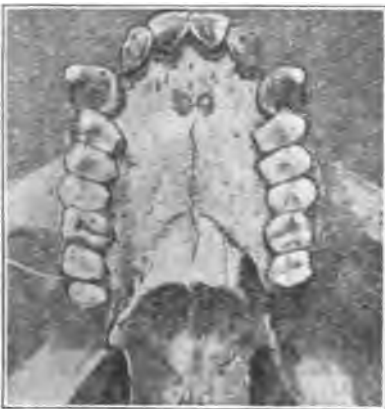


Fig. 6.—*Cebus* unclassified (B.M. 5.5.24.2) to show "echelon" arrangement of the maxillary right molars.



Fig. 7.—*Cebus xanthocephalus* (B.M. 49b). The mandibular third molars are tilted and rotated inwards.

slightly internal to the arch, and in the other² the mandibular first premolars were placed almost transverse to the arch, definite spaces being present between these teeth and the canines.

(2) In one specimen³ there was an abnormal backward slope of the roots of the maxillary third molars.

(3) In no less than eight specimens the mandibular incisors occluded in front of the upper teeth, a fact which suggests that in this genus there is a definite tendency towards inferior protrusion.

The total number of specimens varying was eleven.

Genus *Brachyteles* (the Woolly Spider Monkeys).

Specimens examined 13.

¹*Lagothrix Humboldtii* (B.M. 43.10.21.12).

²*Lagothrix* unclassified (B.M. 11.7.19.1).

³*Lagothrix infumatus* (B.M. 57.10.17.10).

This genus, which is confined to South-east Brazil, forms a kind of connecting link between the *Lagothrix* and the *Ateles*.

(1) The chief interest in this genus lies in the frequency of inferior protrusion. Of the thirteen specimens nine were marked as coming from



Fig. 8.—*Lagothrix Humboldtii* (B.M.95.8.1.4). The maxillary left third premolar is misplaced.

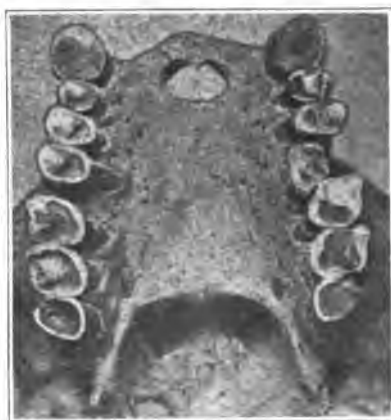


Fig. 9.—*Lagothrix* unclassified, from Marcopata (B.M.0.11.5.15). The maxillary left third premolar is misplaced.



Fig. 10.—*Lagothrix infumatus* from Upp yali (B.M.66.3.28.7), showing asymmetrical of the maxillæ.

Eugenhero River, Espirito Santo. In this group there were seven examples of protrusion of the mandibular incisors; in one the condition was doubtful due to the postmortem loss of the incisors, and in one the incisor bite was edge to edge. Of the four specimens not marked as coming from the Eugenhero River only one showed inferior protrusion.

(2) In one specimen the diastema in the maxilla was absent.

(3) In two specimens there was slight crowding of the mandibular premolars, and in one slight irregularity in the position of the maxillary right first molar and third premolar.

(4) In a *Brachyteles hemidactylus*¹ an additional premolar in the right maxilla had caused the maxillary canine to assume a forward position and the mandibular canine to be misplaced.

The number of specimens varying was eight.

Genus *Ateles* (the Spider Monkey).

Specimens examined 30.

The *Ateles* or spider monkeys show a remarkable degree of variation.

(a) In two cases the presence of extra teeth had led to irregularity of the canines.

(b) In a male *Ateles vellerosus*² there was marked irregularity of the maxillary premolars (Fig. 11). On the left side the third premolar was almost ex-



Fig. 11.—*Ateles vellerosus* (B.M.89.12.7.2). The maxillary premolars are misplaced.

ternal to the bite, while the canine seemed to be placed more posteriorly than normal. In the mandible a slight space existed on both sides between the first and second premolars.

(c) A rare condition was noted in an *Ateles melanochir*.³ The mandible was distinctly asymmetrical; on the left side the cheek teeth were in normal occlusion; on the right side the mandibular teeth occluded external to their normal position.

(d) Among other irregularities noted were crowding of the incisors; a slight space between the maxillary left first and second molars; tilting of the mandibular third molar.

¹B.M. 45.4.2.7.

²B.M. 89.12.7.2.

³B.M.808a

The total number of specimens showing variations in position of the teeth was eleven; in two of these extra teeth were present. In three further specimens additional teeth were noted, making a total of fourteen out of thirty speci-



Fig. 12.—Typical arch in *Mycetes*.



Fig. 13.—*Mycetes* unclassified (B.M.51.4.23.1). Showing irregularity in position of the premolars.

mens showing dental variations. The tendency to vary would appear to be greater in certain species, for example:

In three specimens of <i>Ateles melanochir</i>	..	..	2 varied
In four specimens of <i>Ateles vellerosus</i>	..	..	3 "
In six specimens of <i>Ateles niger</i>	..	..	2 "

¹B.M. 808a.

Genus *Mycetes* (the Howling Monkeys).*Specimens examined* 106.

In *Mycetes* the incisors are small compared with the size of the skull and are set in a curve; there is usually a well-marked diastema; the premolars and molars are arranged in a straight line, the two sides gradually diverging as they approach the back of the mouth. A typical arch is shown in Fig. 12.

The variations seen were as follows:

(a) Slight crowding of the premolars; in three cases both maxillary and mandibular premolars were involved—in four cases only the maxillary premolars. An example is shown in Fig. 13. Three out of the seven cases were in *Mycetes seniculus*.



Fig. 14.—*Mycetes niger* (B.M.50.9.6.14). In this specimen the premolars are placed internal to the line of the molars.

(b) In six specimens a curious arrangement was present, the premolars and molars being arranged in straight lines with the line of the premolars lying internal to that of the molars as seen in Fig. 14.

(c) In a *Mycetes niger*,¹ Fig. 15, the maxillary left first premolar was placed internal to the second premolar; the canine was not present but the condition of the bone suggested that this tooth had been lost from injury, the central incisor was malformed, and it is therefore possible that the irregular position of the premolar in this specimen was due to trauma.

(d) An abnormal spacing of the teeth was present in six specimens. In one case there was a marked space between the maxillary central incisors; in three cases spaces were present between the central and lateral incisors in both the maxilla and the mandible; in one case spaces existed between the mandibular second and third premolars; in one case definite spaces were present between the

¹B.M. 51.8.12.8.

maxillary third premolars and first molars, the mandibular third premolars this specimen being transverse to the arch.

(e) Rotation of the mandibular third molars. In five cases the antero-internal angle was rotated inwards; in one case the antero-external angle was rotated outwards. It is of interest to note that five out of the six specimens belonged to the species *Mycetes palliata*.

(f) Protrusion of the mandibular teeth was present in forty-five cases. The various species show a different degree of variation in this direction, for example:

Species			Number examined			Number showing inferior protrusion
<i>Mycetes palliata</i>	..	..	20	..	..	12
<i>Mycetes Macconnelli</i>	..	..	4	..	..	3
<i>Mycetes ursina</i>	..	..	11	..	..	1



Fig. 15.—*Mycetes niger* (B.M.51.8.12.8). Showing irregular position of the maxillary left first premolar.



Fig. 16.—*Chrysothrix sciureus* (B.M.8.3.7.14). maxillary right canine is misplaced.

(g) The diastema in the maxilla was absent in two cases. The total variations noted were forty-four.

Genus *Chrysothrix* (the Squirrel Monkeys).

Specimens examined 52.

In this genus only three variations were present, as follows:

(a) Irregular position of both maxillary and mandibular premolars.

(b) Irregular position of mandibular premolars; the maxilla being too defective to obtain reliable data.

(c) Irregular position of the maxillary right canine in a *Chrysothrix sciureus*¹ from the Coast Region, Demerara, Fig. 16.

¹B.M. 8.3.7.14.

Genus *Callithrix* (the Titi Monkeys).*Specimens examined* 40.

In this genus the incisors are set in a well marked curve; the canines are not so well developed as in many of the monkeys and are separated from the lateral incisors by a small diastema, which is often entirely absent. The premolars and first molars run backwards and outwards, the second and third molars turning slightly inwards. The arch approximates in character that seen in man. The following variations were noted:

(a) Irregularity in position of the incisors. When the teeth are in occlusion the maxillary incisors are often a little in advance of the mandibular teeth, but there is a tendency for the maxillary lateral incisors to be placed slightly internal to the arch, and in some cases to be overlapped by the distal edge of the mandibular teeth, or to lie in the space between the mandibular lateral incisors and canines. This inward position of the maxillary lateral incisors may be so marked as to constitute an irregularity. An example of crowding of the mandibular incisors was noted in *Callithrix gigot*¹ and in two specimens spaces existed between the mandibular incisors.



Fig. 17 (i.)



Fig. 17 (ii.)

Fig. 17.—*Nyctipithecus* unclassified (B.M.14.4. 25.30). Showing irregularity in position of the maxillary and mandibular incisors.

(b) Irregularity in position of the premolars. In one case the mandibular left canine and premolars were misplaced, the maxillary right premolars were internal to the line of the molars and the lateral incisors were slightly internal to the arch.

(c) Inferior protrusion was present in only one specimen (*Callithrix caligatus*).²

The number of specimens showing variations was ten.

Genus *Nyctipithecus* (the Nocturnal Owl-faced Monkeys).

Specimens examined 35.

Variations were noticed in two specimens, as follows:

¹B.M. 3.9.5.7.

²B.M. 8.5.9.8.

(a) Slight overlapping of the maxillary central incisors with the mandibular left incisor in advance of the corresponding tooth in the maxilla.¹

(b) Slight crowding of the maxillary premolars.²

Genus *Brachyurus* (the Oukari Monkeys).

In the eleven specimens examined, the arrangement of the teeth was normal.

Genus *Pithecia* (the Saki Monkeys).

In *Pithecia* the maxillary incisors are set in a sharp curve; there is a diastema, with the canines placed at the corner of the arch. The line of cheek teeth commences slightly internal to the canine and follows a direction slightly inwards and then outwards. Insufficient space in the region of the molars results in the second and third premolars being pushed inwards to the arch, a condition noted in four specimens.

The only other irregularity noted was in *Pithecia chiropotes*,³ in which the maxillary first premolars were transverse to the arch instead of oblique, as the normal.



Fig. 18.—*Midas* (B.M.0.7.7.2).

FAMILY HAPALIDÆ

Genus *Midas* (the Long-tusked Marmosets or Tamarins).

Specimens examined 84.

In this genus five specimens showed variations in position of the teeth; four of these the irregularity was only slight but in one a remarkable condition was present. The skull was marked as coming from the Perent River and is shown in Fig. 18.

The mandibular right canine strikes the labial aspect of the maxillary central incisor; the mandibular incisors are pushed over to the left side: the maxillary right canine in occlusion lies over the mandibular first and second molars; the teeth in the right half of the mandible, with the exception of the second molars, are in abnormal occlusion.

¹*Nyctipithecus* unclassified (B.M. 14.4.25.30).

²*Nyctipithecus trivirgatus* (B.M. 2.2.1.9).

³B.M. 8.3.7.6.

Genus *Hapale*.

Specimens examined 43.

Three specimens showed variation; in one the incisors were crowded, in a second the mandibular premolars were irregular, and in a third a space existed between the maxillary central and lateral incisors on both sides, the mandibular lateral incisors having grown up into the spaces.

The following table gives the number of variations in the position of the teeth in the various genera:

VARIATIONS IN THE POSITION OF TEETH IN NEW WORLD MONKEYS						
FAMILY CEBIDÆ						
	Number examined		Variations other than inferior protrusion		Number showing inferior protrusion	Total number varying
<i>Cebus</i>	146	..	34	..	3	36
<i>Lagothrix</i>	29	..	6	..	8	11
<i>Brachyteles</i>	13	..	5	..	8	8
<i>Ateles</i>	30	..	11	..	0	11
<i>Mycetes</i>	106	..	28	..	25	44
<i>Chrysotrrix</i>	52	..	3	..	0	3
<i>Callithrix</i>	40	..	9	..	1	10
<i>Nyctipithecus</i>	35	..	2	..	0	2
<i>Brachyurus</i>	11	..	0	..	0	0
<i>Pithecia</i>	40	..	5	..	0	5
—	502		103		45	130
FAMILY HAPALIDÆ						
<i>Midas</i>	84	..	5	..	0	5
<i>Hapale</i>	43	..	3	..	0	3
—	127		8		0	8

The points to be noted are:

- (1) The degree of variation in the Cebidæ compared with the Hapalidæ.
- (2) The degree of variation in the various genera of Cebidæ.

DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

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MOUTH INFECTION AS A SOURCE OF SYSTEMIC DISEASES*

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THE study of the relationship between ill health and defective teeth is, by no means, recent. It has received casual mention in the older literature and has been recognized for a long time by some practitioners of medicine and dentistry. The subject has, however, not received the prominence it deserves, although a good many practitioners have been giving this matter a thorough study and now do not complete case histories unless they have a detailed report on the pathologic conditions that exist in and adjacent to the teeth.

The development of this knowledge marks a great practical advance in the diagnosis and treatment of disease. It is now apparent that many disorders which heretofore were considered obscure in origin and incurable are due wholly or in part to chronic infection, and that such diseases can often be cured, or at least the progress of the disease retarded, by the removal of the primary source of infection.

Chronic sepsis is far more frequent than was formerly supposed. It is now conceded by eminent specialists that few of mature age are wholly free from it. Among individuals examined by Dr. Arthur Black, without reference to complaint, the percentage of periodontal infections was 56 for persons under 25 years of age, 72 for those between the ages of 25 and 30, 87 for those between 30 and 40, 89 for those between 40 and 50, and 100 per cent for individuals over 50 years of age. There is, of course, some variation in statistics reported by different observers. This is due in part to the class and age of the patients examined and in part to slight differences of the basis upon which the diagnosis of sepsis is made.

It is now generally agreed, however, that dental sepsis is one of the most common of the chronic active infections and for this reason ranks theoretically as a very frequent cause of ill health.

*Read before the Milwaukee Surgical Society, November 3, 1919.

Duke reports that oral sepsis as a focus of chronic active infection may be a source of ill health in many different ways. It may harbor and distribute organisms which, under certain conditions, may infect other tissues and give rise to acute or chronic inflammatory lesions. It may have a toxic effect with ensuing disease in both normal and diseased organs. This effect in healthy individuals may perhaps be slight; it may be decidedly harmful, however, in individuals who are depleted by disease. It may also cause functional disturbance in relatively normal organs by furnishing an alien protein to which an individual may have become highly sensitized. In the same way it may increase functional disturbances due primarily to organic disease. Finally, it may cause local pain, referred pain, and headache.

The immediate therapeutic result which follows the eradication of oral sepsis varies and the more conservative often hesitate to promise too much. Frequently the result is excellent. On the other hand, it is often disappointing. It is likely to be disappointing if the removal has been incomplete, or if other coexisting infections have been left intact, also if extreme anatomic changes have been brought about as a result of chronic systemic infection. The best results are obtained in those instances where the systemic effects are chiefly toxic. In these cases a brilliant result often can be secured within a short time.

It is unfortunate that the profession, both in medicine and in dentistry, has not studied the true pathologic conditions in and adjacent to the teeth. The mere suggestion of the report of a single case wherein there was the slightest manifestation of a cure through some form of dental care, started a wave of one or the other forms of treatment throughout the entire country, if not, the dental world. Let me illustrate what I mean. You all remember when some members of the profession who had achieved some reputation as practitioners reported that they were able to cure pyorrhea by the injection of emetine. They went so far as to say that they had obtained cures. This so-called cure for the relief of loose sore teeth became the subject of debate and discussion in our medical and dental journals. Newspapers reported this wonderful miracle. Drug houses, seeing the opening for a good harvest, sent out agents and employees over this entire country, preaching the wonderful cure that could be obtained in the treatment of pyorrhea by adopting emetine as a treatment.

My observation and study of the pathologic conditions involving the teeth and adjacent structures satisfied me that emetine could not bring about the results claimed for it. Today one rarely hears this drug mentioned. It has taken its place side by side with other fads so numerous in the history of medicine. If dental pathology is once mastered, it is only then one can draw certain conclusions in working out a diagnosis. Without a genuine knowledge of the dental tissues, their pathology, and their relation to systemic diseases, both physician and dentist are more liable to err in making a diagnosis and differential diagnosis which will often cause patients to be mutilated and maltreated.

Unfortunately there seems to be a tendency for some practitioners to urge patients who are suffering from rheumatic pains to have teeth extracted without determining the possibilities of eradicating infection without removing these organs of mastication. Such advice is contrary to the laws that govern scientific

diagnosis. Especially is this true of rheumatism, for Dr. Cabot says, "Rheumatism has sometimes turned out, in my experience, to mean aortic aneurysm, cancer of the pleura, tabes dorsalis, osteomyelitis, bone tuberculosis, syphilitic periostitis, lead poisoning, morphine habit, alcoholic neuritis, and gonorrheal infection. Rheumatism is one of the most doubtful of all diagnoses."

These words should prove that all modern aids to diagnosis should be used if one is to safely rely upon his diagnosis.

During the last five years we have tabulated 1,000 cases suffering from miscellaneous systemic complaints, and find that 18 per cent were benefited by the complete eradication of all chronic infections involving the teeth and adjacent structures. Eighty-two per cent were not benefited and it is up to the diagnostician to find out what the contributory factors were that brought on the systemic conditions. Yet, after all, I am satisfied that these 82 per cent who had the oral sepsis removed were benefited in having a clean mouth, and were not liable to suffer from any complications which may arise therefrom.

Time does not permit me to take up this work as I would like to, for volumes have been written and rewritten on this subject covering the subject from the standpoint of etiology, diagnosis, treatment, and prognosis.

There seems to be a diversified opinion among men as to how teeth should be removed. Some practitioners advocate the complete removal of all teeth that are pulpless.

Talbot, in his research on bone absorption around the roots of teeth, reports that dental x-ray pictures do not show the pathology necessary for the guidance in the treatment of interstitial gingivitis, pyorrhea alveolaris, or apical alveolar changes. He finds that there are a number of stages in pathologic evolution from the normal healthy tissue to the fully formed abscess, in which the x-ray does not, and can not, by the present method, discriminate.

To treat diseased teeth successfully, and the alveolar tissues, we must in some way be able to distinguish the finer changes which occur in the evolution of a fully developed abscess. Each stage requires different treatment, and the knowledge of each stage is necessary in deciding whether a tooth can be saved or should be removed.

Talbot further claims that x-ray pictures, as produced today, are far from what they should be. He recognizes the removal of pulpless teeth when all other sources of infection have been executed. He has arrested arthritis deformities, cured headaches, indigestion, boils, skin eruptions, and large glands of the neck by removing pulpless teeth. They did not show defects in the x-ray. I am getting to be more and more inclined to agree with Talbot, and yet we have, in our experience, found that in pulpless teeth, especially single-rooted ones, when treated, and the canal correctly filled, the results were as good as when we would have extracted the teeth. To rely on the x-ray as a guidance in determining whether teeth should, or should not be extracted is problematic. We believe that unless one can grasp the full significance of dental pathology, and be able to differentiate between the various pathologic phases that take place in and about the teeth, one is at sea, and is more liable to err in working out a diagnosis.

The great trouble with the dental profession is that the teaching of pathology

in our dental schools has to be modernized. Unfortunately we find that a large number of dental schools devote too much time to preserving the visible portion of the teeth, and in making restorations which look well and serve well for the purpose of mastication.

Filings, crowns and bridges have not been, and still are not at the present, constructed with a paramount purpose of avoiding sepsis, and have often been attached to teeth so badly infected that the patient was worse off after dental care. This condition still seems to prevail in a large number of our dental schools. If dentists are to be turned out in the future as they have been in the past, I sometimes shudder when I think of the great suffering there will be caused. I mention this for the reason that I have always hoped that the dental profession would take upon itself to better the standard of dental training. So far little progress has been made. The medical profession may yet find it necessary to incorporate the teachings of scientific dentistry, or, I might better say, stomatology, in its curriculum.

Dentistry in the past has been directed towards the preservation of the teeth for the purpose of mechanical restoration and cosmetic effect, and must in the future be destined for the cure and prevention of disease, combined with cosmetic and functional purposes. In order to impress upon you the result obtained by removal of septic conditions as found in the mouth, I wish to report the findings of a few of our cases:

Mr. C. J. B., age thirty-six years; occupation, salesman; weight 150 pounds, normal weight 220 pounds; complaint, rheumatism. Two years ago he began to suffer from rheumatic pains, and was in bed for six weeks. He was treated by his local physician, and relief came after two months. He had lost 70 pounds in weight. There was a recurrence of his trouble about six weeks before he came to us. He was unable to walk without the aid of crutches, and he found it very difficult and painful. His physician could not find any contributory factor, and, therefore, advised that his teeth be examined. Examination of his mouth showed that he had a well-formed jaw, a full set of teeth, no gingivitis or pericementitis. There was a gold shell crown on each upper lateral. These crowns had been put on for cosmetic purposes when he was a young man. The crowns extended considerably under the gingiva. By palpation over the gum margin, a cheesy-like thick secretion would ooze. The x-ray examination of his teeth showed nothing abnormal. The crowns were removed, and with the aid of the high-frequency we tested the teeth for vital pulps. All responded except the two upper laterals. We diagnosed the two laterals to have dead pulps. The canals were opened up and found to be markedly putrescent. The operation had thus far tired him to the extent that he was unwilling to have anything further done. We recommended the extraction of the two lateral teeth, and he was referred to the hospital so that better care could be given him. This was done. About 24 hours after the two teeth were removed he developed a marked reaction. His temperature went up, and the pains in his joints were excruciating. He was put under the care of a local internist, and by keeping him in bed and giving the usual care his pains began to subside the third day. The fourth day his temperature was normal. He left the hospital after being there ten days, and

could walk without the aid of crutches. He has since gained in weight, and has had no recurrence of his so-called rheumatism. This interesting case supports Talbot's contention. The x-ray was of very little help in determining the cause of his trouble. Knowing that gold crowns endanger the vitality of the pulps, and usually bring on pericementitis, we promptly removed them, and then made the further tests.

Mrs. Anna C., age forty-four years; occupation nurse; 30 pounds underweight; complaint, severe headaches and stomach trouble. This condition had prevailed for three years. The appendix and tonsils had been removed, as it was thought that they might be the cause of her trouble. Heart, lungs and kidneys were normal. Patient very nervous. During the last six months she had been taking osteopathic treatments, which she claimed gave some relief to her head. In examining her mouth we found that it was unclean—the mucous membrane congested, and a marked deposition of tartar. There was an ill-fitting upper right bridge, each holding poorly fitted gold shell crowns. The diagnosis was septic teeth plus a suppurative gingivitis. The tartar from her teeth was carefully scaled, the gum margins treated, swabbing with Dakin solution, the teeth brushed and polished, the bridge removed, dead teeth extracted, and the sockets carefully curetted. We saw her nine times. The pains in her head had disappeared, and her stomach disturbances had been considerably improved. She was advised to report at the office if she should have any further trouble. So far we have not heard from her.

Edward J. M., age thirty-five years; occupation, motorman; weight 150 pounds; complaint, general nervousness. At times he feared driving the car. This would be so grave that he was ready to give up his work. He had pains in his body at times, especially in his back, and he found it difficult to arise after bending. There was a dull aching pain around his teeth continually, severe headaches, and for a time he had pain in the left wrist. He was referred for dental care by the company's physician. Examination of his mouth as to cleanliness was poor. The mucous membrane had a dull purple-like color—would bleed whenever he would bite into anything, like an apple or a crust of bread. Upon palpation over the gum margin considerable pus would ooze out, and with a fine explorer we found deep pockets lying under the gum margin. He had extensive bridge work in the upper and lower teeth. There was a marked deposition of tartar on the lingual surfaces of the lower teeth. The teeth were quite loose. An x-ray examination showed that there was considerable bone destruction around the teeth; nothing wrong at the apical ends. A diagnosis showed suppurative pericementitis. We recommended the complete removal of all teeth, cleansing out all the sockets, and then restoring the organs of mastication with artificial dentures. To this the patient consented. The teeth were removed a few days later and after the gums had fully healed, artificial teeth were fitted. He has since regained his health and considerable in weight.

Mr. H. P., age fifty-nine; occupation, farmer; weight 200 pounds; complaint, extreme pain in his right knee. This condition prevailed for the past 9 months with increasing intensity, causing the patient to be unable to walk without the aid of a crutch during the last three weeks. The pain was more severe

during the night while lying down. Physical examination proved nothing abnormal. This was reported by his physician. Upon examination of his teeth we found that the patient was suffering from a marked gingivopericementitis. Upon pressure on gum tissue with the index finger, one could notice a marked discharge of pus. X-ray examination of his teeth showed nothing abnormal. Diagnosis: acute arthritis; contributing factor, suppurative gingivopericementitis. Patient was given curettements, and rigid prophylaxis, and the packets swabbed with Dakin solution. All dental plaques were removed and the teeth polished. At first there was a marked increase of pain in the knee, but this gradually disappeared, and after about ten treatments the patient was free from all pain, and discharged, cured.

Mr. S. W., age thirty-one years; occupation, salesman; weight 148 pounds; complaint, severe headaches radiating down the back of his neck, which was more severe at night. Examination of his teeth showed that his mouth was well taken care of, teeth looked clean and there was no evidence of gingivitis. The x-ray examination found the teeth to be normal except there was a morbid condition at the root end of the upper left central. The root canals were well filled, and held a gold filling at the mesial surfaces. Diagnosis, apical ostitis. The tooth was removed, and upon placing a curette in the socket, I removed a chronic inflammatory mass usually called a granuloma. The wound was swabbed with iodine, and a few days later he reported that the headaches had disappeared.

One of the most interesting cases I ever treated was the mother of a very prominent physician, and I will give you the history of this case as they gave it to me. The patient was sixty-five years of age, a housewife; past history negative; had given birth to four children, all normal. She had always been in good health. In March of 1914 the patient was sick with grippe. She ran a temperature for weeks, and had acute pain in temples and forehead. There seemed to be a great pressure in the palate bone and nose; eyelids were swollen. In April an eye specialist was consulted, and glasses were fitted. In May she consulted him again, when a diagnosis was made of sinus trouble. She was operated on, remained at the hospital one week, and returned home. She stayed in bed for two weeks, loss of appetite, and very restless. In June a further examination of her nose was made, and a large polyp was removed from the right nostril, but her condition was gradually getting worse. By this time she developed a gastritis, a great pain in her right arm. On July 22 she went to a sanitarium, and diagnosis was made of nephritis. She was given the usual care. In September she was very miserable. Her complexion was a greenish yellow; she lost weight, and still complained of the pressure in her head, and in the region of the palate bone, and extreme nervousness. During the month of October she was confined to her bed and given opiates to give relief. She then was referred to me for examination of her mouth. She wore an upper poorly fitting rubber denture. The lower posterior teeth were missing. The six anterior teeth were slightly loose with marked pockets following the long axes of the roots. Considerable tartar was found attached to the teeth, and lying under the gum margin. The upper gum tissue was very spongy and flabby. Diagnosis: suppurative osteopericementitis, complicated by an abnormal occlusion and faulty

articulation. The teeth were removed. The diseased area was thoroughly curetted and given the usual care. The patient was advised to discontinue wearing the upper plate. Up to this time the patient had lost 33 pounds in weight. After she was given dental care she was sent home a few days later, and a week following I received a letter from her telling that her condition was beginning to improve. One month after the operation I received another letter in which she wrote that she was well and was ready to have artificial teeth constructed. This was done six weeks later, and the patient has fully regained her health.

I could go on and on citing many, many cases wherein the abnormalities of the mouth were the contributing factors that brought on systemic disturbances. Time prevents me from doing so.

In the examination of the mouth in order to determine whether there are any contributing causes that might bring on complaint, it is well to observe the following:

1. Careful inspection of the teeth, the number missing, the number of dead teeth, the occlusion, and the forces of mastication.

2. Inspection of the mucous membrane of the entire oral cavity. In mechanical construction of artificial teeth, such as crowns, bridges, and fillings; the contour of the fillings, ascertaining whether there are any overhanging margins which will permit the accumulation of particles of food and other foreign substances.

3. Exploring the attachment of the soft tissue at the gingiva to ascertain whether there are any pockets; the tartar that may be found around the teeth, and upon palpation whether there is any pus oozing from the gum margin.

4. The testing of the teeth with electrical current to ascertain the vitality of pulps.

5. A complete x-ray examination of the teeth.

These five simple rules should be of great help to diagnosticians to help them work out a better and more complete diagnosis.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Pathologic Conditions Caused by the Impaction of Teeth. Ch. A. Barnhill. Indianapolis Medical Journal, 1920, xxiii, No. 1, p. 6.

Unerupted or impacted teeth are recognized etiologic factors of pathologic conditions such as headache, neuralgia, nerve disturbance, earache, ocular disorders, sometimes primary dementia, and epilepsy, besides neoplasms affecting either the upper or lower jaw. The teeth most frequently impacted are the lower third molars, the next are the upper cuspids, followed by the upper third molars and then the lower cuspids. The pressure of the third molar in its efforts to erupt, against the second molar will cause resorption of the parts of the latter tooth. The resorption may become so extensive that the nerve or pulp of the tooth is encroached upon and a direct irritation is set up, as in a case in the author's experience. Pressure upon the inferior dental nerve from the impacted lower third molar may result in a serious condition. The root development of these teeth may cause infringement of the root upon the inferior dental canal. When this condition is present, the pain is quite likely to be manifested in some other portion of the head as well as in the region of the offending tooth. The impacted lower third molar is probably the source of more conditions of referred or reflected pain than any other organ of the head or jaw. If a wisdom tooth has not erupted at the age of twenty years, it should be located with the aid of the x-ray and in all pathologic conditions a careful radiographic examination should be made for the purpose of locating any impacted teeth. The most common and perhaps the most prevalent disturbances encountered in conditions of impaction are local infections of the soft tissues surrounding the teeth, particularly in the case of the impacted lower third molar.

Treatment of Cancer of the Tongue by the Bloody Method. Sebileau. XXVIII Congres francais de Chirurgie, Paris, October 6-11, 1919.

Lingual cancer should be extirpated as soon as it appears. The gravity of neglected cancer and the failure of delayed intervention are due to histologic, as well as anatomic, reasons. In consequence of the excellent lymph supply of the tongue, cancer is propagated with such rapidity that some observers do not admit a strictly local affection. Anatomically the tongue, on account of its close

muscular and mucomembranous connections, is often not alone involved, and the numerous forms of mixed cancers, encroaching upon the neighboring regions, require such radical removal in a deep and vital region as to render the prognosis highly unfavorable. Surgical extirpation is the only practical procedure available, but the operability of lingual cancer has its limits, and the author admits the following contraindications: (1) extension to the glossoepiglottic fold and the epiglottis; (2) invasion of the two pillars of the fauces and of the lingual tonsil; (3) deep infiltration of the maxilla; (4) invasion of both halves of the tongue beyond the horizontal line; (5) indefinitely outlined inflammatory glandular congestion. For the radical removal of the cancer, the author rejects total amputation as well as total hemiresection as far as the deep attachments of the tongue. No matter how rapidly the cancer spreads from in front backwards, the results show the benefit obtained from a graded though liberal amputation, which can often be accomplished by the natural passages after extending the labial commissure. Even in the presence of diseased submaxillary and carotid glands, all cancers anatomically capable of being removed through the mouth should be extirpated by this route, which can be widened if necessary. The operation should be performed in a single session, provided the patient's condition permits, beginning with the extirpation of the glands. When the operation has to be performed in two sessions, it should be started with the tongue. Amputation by the mouth, aside from the dangers of delayed hemorrhage, is a fairly harmless operation. Resection of the mandibular margin is more serious, while the transparietal and transmaxillary routes are even more so, all being inevitably accompanied by suppuration and exposing to the risk of secondary infections. The most frequent cause of death is sepsis. Statistical figures vary greatly and are apt to prove misleading. The following is the average for the three months following the intervention: buccal route, 5 per cent deaths; transparietal route, 30 per cent; transmandibular route, 40 per cent. The first is a maximum, the last two are a minimum estimate, the only conclusion to be drawn being the very evident harmlessness of operations through the natural passages and the gravity of the others, in spite of all postoperative precautions. Survivals beyond three years are estimated at 40 per cent in cancers operated upon at an early stage. Survivals in long-standing cancers or in those operated upon through the parietal and mandibular routes are much rarer, but favorable cases are occasionally met with.

The Treatment of Antral Suppuration. S. Hastings. *The Lancet*, London, 1919, ii, p. 960.

Before promising that the antral operation will completely cure the condition, the operator must have ascertained that there is no disease of the frontal sinuses, ethmoidal cells, or superior maxilla. Where other sinuses are also involved, the infection of the antrum is moreover usually most severe, owing to its imperfect drainage and its large size. At any rate, the pus contained in it will be much more commonly fetid and the bacterial flora more varied. Operation on an infected antrum at the same time when the anterior ethmoidal cells are cleared out, accordingly exposes the ethmoidal region to contact with a very infective pus, with the result that acute inflammation of this region and meningitis are liable to supervene.

The nasal operation is recommended by the author, on the basis of personal favorable experience with it. Under no circumstances should a permanent opening for drainage be made into the mouth, meaning the establishment of a permanent drain from the antrum to an infected cavity like the mouth, as is done after the alveolar operation. On the other hand, after the nasal operation, the antrum is drained into a relatively aseptic cavity. It is probable that the posterior regions of the nose are free from organisms in at least eighty per cent of ordinary healthy people, and even where persisting nasal disease is the cause of the antral trouble, the bacterial inhabitants of the two cavities will be very similar. The nasal operation, in which the whole of the antro-nasal wall is removed without first opening the antrum through the mouth, is almost invariably performed by the author, who has never known it to fail. He has occasionally performed it under local (cocaine) anesthesia, but a general anesthetic, very lightly given, so that the cough reflex is present during the whole operation, is much more convenient. The after-treatment is very simple, syringing can usually be interrupted at the end of three months, to be resumed until the discharge has ceased and the patient is cured.

The Dental Surgeons. Sir Cuthbert Wallace. *British Medical Association Proceedings, London, 1919, p. 33.*

In describing the rise of the casualty clearing station, the author emphasizes the part played by the dental surgeon. Not only did the dental surgeons do urgent dentistry, but they did an endless number of fillings and conservative work, and supplied thousands of dentures. Every one of them has been more than fully occupied. In order to minister better to the troops, they used to leave the casualty clearing stations on certain days and travel round the ambulances, so that men in the front line could come back and have their teeth attended to without being detained in the hospitals. There have also been various mobile dental units. The Canadians had a very perfect dental organization. Their dental surgeons were attached to the ambulances, and did an immense amount of work in the forward area, even to the provision of gold plates. The part played by the dental surgeons became more and more important as the war went on, and their help in healing the wounds of face and jaw has been of the utmost value. Many wounded men who now lead a comfortable life owe their recovery to the skill of the dental surgeon.

Outside his own professional work, the dental surgeon in many casualty clearing stations performed a very necessary but uninteresting piece of work. He was the entraining officer who handed over the patients to the medical officer in charge of the train. This was a job that often required a good deal of tact, judgment, and charm of manner.

When the war ended, there were 106 dental surgeons with British units.

Pyorrhea Alveolaris. W. Stuart James. *The Medical Journal of South Africa, 1919, xiv, No. 10, p. 455.*

The inflammatory condition of the gums accompanied by the discharge of pus, known as pyorrhea alveolaris, is attributed to many causes, notably to the *entameba buccalis*, and to deposits of foreign matter on and around the teeth, in

the form of tartar or calculus, either salivary or serumal. Of the other theories, one is that the saliva holds calcium phosphate and carbonate in very unstable suspension, and in the presence of air, carbonic acid gas is liberated and the calcium salts precipitated. Recession of the gums is not necessarily a feature of the pathology of pyorrhea, but may be due to faulty circulation and insufficient nourishment. Pyorrhea abscesses are located near the cervical border, a favorite place being between the roots of the molars, just under the crown. Protrusion and separation of the upper teeth are often present, due to the inroads of pyorrhea loosening the supporting membrane on the lingual, and undertension on the labial. Failing other signs, x-ray examination is a most useful diagnostic adjuvant, showing not only the disease itself, but the extent to which the alveolar process has been affected, and also any abscess or pus pockets. It will also be a sure guide as to what extractions are necessary by exposing perforations, filled root canals with protruding gutta percha points, root absorptions, etc., all of which make it practically impossible to restore them to normal, and may serve as a sufficient source of infection to seriously injure the chances of curing the others. The duration of pyorrhea is very uncertain, depending on the length of infection. It is certain, however, that it never gets better without treatment, but will continue to get worse until the teeth are exfoliated.

The Vital Staining of Teeth. T. Takamori. *Kyoto Journal of Medical Science*, 1918-1919, xv, No. 5. (Japanese.)

Under employment of carmine, the dentine in the author's experience is stained in its inner zone, the width of this area varying with the tooth and with the position of the section. The cement is seen to be stained in the vicinity of the dental periosteum and beside the Haversian canals. These findings are in conformity with those noted in bone. The pulp and the peridental membrane are found to contain numerous phagocytes or histocytes which have taken up the carmine granules, and the same stained corpuscles are also encountered lying along the blood vessels.

Dental Caries in Relation to Oral Osmosis. Raguar Eckermann. *Mono-graph*, London, 1919. (Printed in Sweden.)

The fact that osmosis can take place through the teeth under certain conditions has been fully established by the authors, in conformity with other investigations. Moreover, under commonly occurring conditions, osmosis actually does and must take place through the teeth; with the inevitable result that plasma from the blood vessels of the pulp is forced up to the osmotic entrance on the tooth, contributing to the formation of the carious area, quite independently of whether or not the protective membrane which has formed is permeable to the salts of the saliva and of the blood. (As a result of transformation, the carious dentine develops very peculiar properties, this transformation tending to form a semipermeable membrane which hinders foreign toxic substances from entering the body.) Enormous quantities of osmotically active substances are introduced into the human mouth, and such substances give the saliva a considerable osmotic strength. When directed against the teeth, this power forces the plasma

of the pulp to the saliva. A clearly visible canal exists between the carious area and the pulp, containing blood plasma, which offers a very favorable culture medium to the microorganisms in the carious matter. The microorganisms of caries can not exist solely upon the dentine and the enamel, but will successively break down the dental tissue. The caries canal represents a physiologico-pathologic connection between caries and the pulp, containing iron and blood.

According to the osmotic theory as explanation of the initial origin of caries, it follows that natural caries can not be the result of pure objective factors, but is the result of reciprocal action between the living element of the tooth and certain agents soluble in saliva and able to develop osmotic super-pressure to the blood of the pulp. These objective factors are: (1) sodium chloride; (2) sugar of different kinds; (3) medical salts; (4) different chemical preparations, used as spices, condiments, etc. Sodium chloride may, in over consumption, be regarded as a physiologic poison to the human mouth. Powerful mastication and abundant consumption of common water, a sparing consumption of salt, sugar, chemical preparations, aerated drinks, and avoidance of too hot liquids and food are the leading principles of prophylaxis of dental caries according to the osmotic theory. As the osmotic pressure grows swiftly with rising temperature, all hot liquids containing harmful preparations are comparatively many times more dangerous than cold beverages. A moderate temperature of food and drink is therefore advisable, especially for children. To a cup of tea or coffee holding about 100 c.c., not more than one piece of sugar (6 gm.) must be added.

It is only during the last fifty years that the consumption of strong osmotic agents, sugar, and certain medical preparations, has extensively increased; this consumption of harmful materials corresponding with the increased spread of dental decay. Sugar and chemical substances are known empirically as agents in the development of caries; these substances produce, when dissolved, the physical process called osmosis. It has been shown experimentally that the teeth are sensitive to osmotic influence, in other words, they permit osmosis under certain conditions. The claim of osmosis as the secret driving factor in the genesis of caries rests upon a logically and empirically stable basis. Caries of the teeth (not artificial caries or gingival erosions) is to be regarded as a plasmolysis of the tooth.

Papillomata of the Buccal Mucosa. Levy-Bing and Gerbay. *Annales des Maladies Veneriennes*, 1919, No. 10, p. 608.

The authors were enabled to observe a case of papillomata of the buccal mucosa in a young Arab twenty-two years of age, who was under treatment for a syphilitic chancre of the prepuce. This chancre was typical, and the Wassermann reaction was entirely positive; secondary manifestations were absent. Examination of the mouth, however, revealed the presence of small tumors having an appearance very similar to ordinary genital proliferations. The mucosa of the internal aspect of the right cheek, at the level of the teeth, presented a collection of small eminences, some hemispherical and sessile, others more voluminous and pedunculated, with a puckered crest. At the periphery of this chief collection,

which was three centimeters long by eight millimeters wide, there were a few isolated lesions the size of a small pinhead, barely protruding above the surface. The coloration of the mucosa at the level of these papillomata was normal, perhaps slightly paler than the surrounding tissues. To the touch, the growths felt like solid but flexible granules, as if the fingers were in contact with genital proliferations. These excrescences had originated about six months previously. The patient complained of no unpleasant sensation, spontaneous or on contact, but a rather severe pain was sometimes experienced while eating, due to the papillomata being caught between the dental arches, or crushed by certain hard foods, such as bread crusts. The numerous membranes of the left cheek, the palate, the tongue, and the pharynx presented no abnormal protuberance; but on the upper lip were two lesions having the appearance of condylomata, measuring about one millimeter, exactly circular, papular, with a smooth surface and of a yellowish-pink color. Furthermore, two typical condylomata about the size of one millimeter, circular, with a smooth surface and of a yellowish color, were seen at the upper portion of the left upper eyelid. On examination of the genital and anal regions, no proliferations were found. The treatment adopted for the buccal papillomata consisted in scraping with the curette, after local anesthesia with ethyl chloride.

Ocular Disturbances of Buccal Origin. A. Terson. *La Clinique Ophthalmologique*. 1919, viii, No. 2, p. 81.

It is undoubtedly of advantage to emphasize from time to time the certain, probable or possible dental etiology of numerous affections of the eye and its adnexa, when after a very careful examination no other etiology seems to be admissible. The relations between dental affections and eye diseases were pointed out by the author in 1911, with special reference to those dental and buccopharyngeal conditions which are apt to involve ocular sequelæ. The etiologic connection sometimes is based on certainty (orbital and occasionally ocular affections), or on a great probability. In the presence of an obviously infected mouth, together with ocular disease of unknown cause, the dental origin is plain, if not demonstrable. In certain ocular affections of uncertain etiology, for example, in acute unilateral retrobulbar neuritis, this dental origin is entitled to special inquiry, in the opinion of the author; but in a number of eye diseases developing on the basis of some infection or a general chronic disease, acquired or congenital, an etiology through a neighboring focus such as the mouth, nasopharynx, cavities, and so forth, would seem to be rarely exclusive. The infectious focus determines the ocular lesion merely by acting upon a soil of lessened resistance, and the ocular localization supervenes at the time of a dental caries, angina, or nasal infection. The various etiologies are often superadded, so that it is advisable to admit a preponderating but rarely exclusive oculo-dental etiology. Treatment should therefore never be restricted to the mouth, but in all patients having eye disease of doubtful origin and diseased mouths, all abnormal general conditions, functions, visceral apparatus, and so forth, should be treated as well as the mouth, by polyvalent therapeutic measures, as it were. Oculodental complications, under proper hygiene of the mouth, should soon be numbered among the almost invariably preventable diseases.

Eyes Affected by the Teeth. M. K. Bridges. *The Dental Mirror* for 1845, p. 18.

[The following note is offered to the readers of the Abstract Department on account of its historical interest and as a proof of the excellent information enjoyed by the dental practitioner of seventy-five years ago.]

We have had within the past three months, a gentleman under treatment whose right eye was almost incessantly affected with pain and tears, from pain originating in the molar teeth on the same side, which were perfectly sound. The first bicuspid, which was slightly decayed, was first removed, without much relief. In the course of three months, two molar teeth were removed. The last gave perfect relief. The origin of the pain was in the antrum, into which the roots of the second molar protruded. The pain and overflowing of water of the eye was from nervous sympathy, not from any direct communication between the teeth and eye.

Pulp Nodules. D. E. Caush. *British Dental Journal*, 1919, xl, No. 24, p. 885.

The pulp tissue in which these nodules are developed is of vital importance to the life of the tooth, and on account of its varied functions, it is a tissue of special interest to the dentist. It not only supplied the necessary nourishment to the hard tissues by which it is surrounded, but when necessary, seeks to defend itself from both external and internal enemies to the inroads of which it is subjected. This function of defense the pulp accomplishes by producing a hard tissue from its substance, known as secondary dentine, which may be considered as, (a) normal; and (b) pathologic. The latter is the result of irritation to the pulp tissue, and is formed for the purpose of defense against an enemy which may be exterior to the pulp, as in erosion, attrition, abrasion, or the earlier stages of caries. These are also at times enemies to be found within the camp, and as there are no lymphatics in the pulp, its only method of defense is to envelop the enemy found within its borders by surrounding it with hard tissue. This enveloping process results in a pulp nodule, which is usually formed in the pulp to protect it from any foreign or dead substances, which may take the form of dead cells from the tissue, or from red corpuscles liberated from the capillaries, either by rupture of the latter, or by their walls allowing the corpuscles to pass through as a result of disease, or from any disease that may produce dead tissue in small quantities of the pulp. The position of the secondary dentin is controlled by the position of the foreign matter in the pulp; the nodules are to be found from near the radical apex of the pulp chamber to the opposite end where the pulp is contiguous with the dentine. In size and shape the nodules vary from microscopic points to large, irregular masses; in extreme cases almost filling the whole of the pulp chamber. There is little or no discomfort produced in those cases where the pulp nodules do not press upon or involve the nerves in the pulp; but when their development occurs near any of the nerves, and as a result of their growth, pressure is produced upon the nerves, pain is felt, the amount of which is controlled by the amount of pressure produced. The most acute pain may be set up by the formation of nodules in the restricted area of the pulp, near the point where it enters the dentine.

When sections of the nodules are examined by the aid of the microscope, they are seen to vary considerably in structure, from dense, almost structureless tissues, sometimes laminated with few markings, to those containing many markings and at times irregular spaces, caused by portions of the tissue not having been calcified during the development of the nodule.

The Care of the Teeth in Relation to Motherhood and Infancy. C. P. Blay.
British Dental Journal, 1919, xl, No. 24, p. 887.

In the formation of the teeth, two things are of great importance; first, the provision of correct nourishment, and second, the absence of any poisons in the blood. The teeth germs are first to be found in the fetus about seven weeks after conception, and calcification, or the deposit of lime and other salts, commences at sixteen weeks, when the germs of the permanent teeth may first be found. Unless the maternal blood contains all the proper salts and vitamins, the teeth of the child are likely to develop soft, that is, much less able to resist the attacks of acids or germs. Development is also seriously interfered with by the presence of any poisons, such as mercury, toxins from any acute or chronic infection, and parasites, such as syphilis. In the diet of a pregnant woman, the presence of sufficient vitamins and bone salts is of the greatest importance. Given good feeding, enough exercise, and plenty of fresh air, besides proper care of the mouth, there is no reason at all why the teeth of a pregnant woman should be affected; but where there is food shortage, the tissues of the mother always tend to suffer rather than those of her unborn child. The vitamins mentioned above are found chiefly in fresh and natural foods, and especially in the outer skin and husks of vegetable foods; for instance, unpolished rice, oatmeal, and whole meal flour contain many more vitamins than polished rice and white flour. After a child is weaned, hard food should be started as soon as the teeth are able to chew. The constant administration of mercurial powders to infants not only leads to stomatitis, but also seriously damages the enamel of the growing teeth. The best drug for use locally in mercurial stomatitis in infants and adults is chlorate of potash as a tooth powder or mouth wash. Common salt makes a very cleansing powder for the teeth, but if this is not sufficient to remove slime, soap and whitening is cheap and efficient. The last food taken at a meal should be of a detergent nature, such as raw fruit.

Industrial Medical and Dental Clinics in the Women's Garment Trades.
G. M. Price. *Modern Medicine*, 1919, i, p. 47 (New Series).

A medical clinic was established in 1912, by the Joint Board of Sanitary Control, in the women's garment trades of New York City, and since its establishment has made more than twenty-seven thousand examinations. An important extension of the activities of this clinic is the dental clinic, a unique establishment in the fact that it is probably the first industrial cooperative, self-paying, dental clinic established, conducted, and managed by the workers themselves. The twenty-seven thousand examinations made in the medical clinic have clearly shown that a great many of the workers are suffering from defective teeth, and have likewise shown that a large number of these defects were directly contributory to various diseased conditions among these workers. Furthermore, it has been

shown that the ordinary dental work which has been perpetrated upon the poor workers on the east side in New York City not only does them no good but does them real harm. Many of their dental defects are simply hidden and obscured by the gold crowns and bridges which are so lucrative to the dentist and so harmful to the patients.

The dental clinic is established to do thoroughly honest work in dentistry at a reasonable cost. The clinic employs a competent medical dentist who is doing good work and whose purpose is not so much curative as prophylactic. Educational work in prophylaxis is carried on all the time and is the main purpose of the clinic. All work is done in the clinic, which at present employs two full-time and two part-time dentists. During the year of 1918, the dental clinic treated 7,465 patients, and has had an income of \$12,576.73. It has practically paid for itself, although it had a slight deficit of \$292. The charges to patients are based upon cost, approximately \$2.50 being charged for an hour's work. Both the medical and dental clinics are very popular among the workers, and have proved successful in every respect.

Experimental Evidence Demonstrating the Influence of a Special Dietetic Factor on the Development of the Teeth and Jaws. M. Mellanby. The Dental Record, 1920, xl, No. 2, p. 65.

The author emphasizes the importance of vitamins in the diet, especially of the young. Only very small quantities of vitamins are required, and for this reason these substances must be put in a nutritive category different from that which comprises the better known foodstuffs, such as proteins, carbohydrates, and fats. There is at present no knowledge concerning their chemical nature. Three separate vitamins are known: (1) Antiscorbutic; (2) Water soluble B, or antineuritic; (3) Fat soluble A. They are associated with natural foods and can only be recognized by what they do to the animal body or by what follows when they are specifically absent from the diet. The antiscorbutic factor is that one which, when absent from the diet, gives rise to scurvy. It is found in the largest quantities in fresh foods, especially in fresh vegetables and fruit; the orange and lemon being particularly rich in this respect. Water soluble B is probably identical with the antineuritic, or anti-beri-beri, factor. It has a very wide distribution in nature, and is present in the majority of natural foods examined; it has a great resistance to heat. The vitamin known as fat soluble A and believed to be necessary for growth is not always found associated with fats and is not even always soluble in fat solvents. This factor is present in most animal fats and in green vegetables. It is deficient in linseed, rapeseed, and hydrogenated fats. It appears to be fairly resistant to heat, lying in this respect between the antiscorbutic and antineuritic factors. The most widely distributed of the three factors is water soluble B, and with a mixed diet, there is no danger of a deficiency of this vitamin; neither is there much real danger of a deficiency of the antiscorbutic factor so long as the food eaten has not in its preparation been subjected to prolonged heating.

It is, however, very easy to choose a diet in which fat soluble A is deficient, very little or none being contained in a diet consisting largely of bread, porridge, rice, and other cereals, lean meat, margarine, jam, tea, sugar, etc., all very popu-

lar articles of consumption, especially among the poor. Evidence is adduced by the author, which suggests that the deficiency of this factor in the diet of the young may be responsible for many of the defects of modern teeth and jaws, and possibly indirectly for the prevalence of caries among civilized communities. In other words, however much calcium there may be in the diet, it can not be used by the tissues to the extent necessary for the construction of normal teeth and jaws, unless fat soluble A, or something with a similar distribution, is also present. Demonstration specimens shown by the author, consisting of puppies' jaws, drawings, histologic sections of jaws and teeth, x-ray photographs and lantern slides go to prove that in the case of puppies at any rate, fat soluble A or something with a similar distribution to that substance, is one of the principal factors involved in the normal growth of the jaws and teeth. It appears that the younger the animal, the more essential is fat soluble A, and the more rapid the rate of growth, the greater the quantity needed to keep that growth normal. Whether fat soluble A works directly on the ameloblasts and other calcium depositing cells, or whether it has an indirect effect by stimulating some intermediate tissue, must, for the time being remain simply a case of conjecture. There is, of course, evidence that certain endocrine organs, such as the pituitary, the parathyroid, and the thymus glands, are involved in calcium metabolism, but there is no experimental evidence that fat soluble A has any specific effect on these bodies.

It has been the author's endeavor to furnish evidence that the origin of many dental defects is possibly largely dietetic, and that the factor at fault is very definite in its action. A palatable diet can be arranged with its fat soluble A content so as to produce sound teeth and normal jaws.

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EDITORIALS

Some Unfairness in Classifying Dental Schools

SINCE the organization of the Dental Educational Council of America and its attempt to classify the dental schools according to the requirements, as outlined at the Louisville meeting July 24th, 1916, and later revised August 3rd, 1918, a great many difficulties have arisen that have subjected the council to criticism. We believe that as a whole the action of the council has been for the benefit of the dental profession and to the advantage of the dental students, but we are also convinced that some schools have been given a much better standing and classification than they are entitled to and a great many schools have been made to appear in a very unsatisfactory light.

The classification of dental schools has been more or less an arbitrary matter, based upon requirements which the Dental Educational Council has selected, and which have not been strictly adhered to in a number of cases. Schools meeting with certain requirements laid down by the Dental Educational Council of America, have been given a Class A rating, while "schools which in certain particulars

do not meet the requirements of the Class A, but may become eligible for Class A without complete reorganization" have been placed in Class B. The first great unfairness or injustice appears in the establishment or formation of Class B schools. There is no definite reason why a school is a Class B, except that "in certain particulars" they "do not meet the requirements for Class A." As a result of this classification it follows that in a great many instances the difference between a Class A and a Class B school may not be as great as the difference which exists between two Class A schools. In other words, some Class A schools are far superior to other Class A schools. Again, a great many Class A schools may be placed in that rating by a small margin, while the majority of Class B schools fail to get in Class A also by a very small margin. However, the majority of the public and the dental profession are inclined to believe there is a great difference between Class B and Class A schools. This difference does not exist.

We have always contended the greatest factor in the classification of dental schools should be based upon the work which the dental school is doing, and this work should, to a great extent, be judged by the number of students that pass the state board examination and the quality of men that have resulted from the graduates from the particular school.

In considering the classification of dental schools, we believe that a remark made by Dr. T. E. Purcell of the State Board Dental Examiners of Missouri sums up the situation in the most logical manner. We are also convinced of the fact that Dr. Purcell's statement is based on actual contact with graduates from various schools during the time he has been a member of the state board. Dr. Purcell says: "I want to call your attention to the fact that the classification of schools by the board [The Dental Educational Council of America] is an arbitrary classification, absolutely arbitrary. I maintain in the state of Missouri we have dental colleges, we have Class B schools that are superior in every respect to Class A schools that have been classified by this committee. The classification is not standardized. The fact that we have Class B schools is no reflection, because they turn out as good men as there are in the United States."

From the knowledge we have of the various students and the various men in the dental profession, we are convinced that Dr. Purcell's statement is absolutely correct: namely, there are just as good men graduated from Class B schools as ever came from a Class A school. The finished product of the dental school or the graduate as he goes out into the profession should be the greatest factor in considering the ability of dental schools to teach dentistry.

The National Educational Council of America has laid great stress upon the administrative policy of dental schools, and has placed great importance upon the value of the building and equipment, which we have always believed to be only one of the external evidences of the dental school. Such a requirement gives the schools with newly constructed buildings an advantage over those with older buildings; but it does not necessarily mean that the institution with the new building is going to turn out any better dentists than the school with the old building. A classification of dental schools according to Classes A and B forms in the mind of the public the idea that Class A schools are far superior to Class B, when, as a matter of fact, they are not so far superior, and, in some instances, not at all. In fact, we believe a number of schools succeeded in getting into Class A by

a very small margin, while a number of Class B schools were kept in Class B because they were deficient only in a small number of points. However, the public fails to recognize this, but is constantly thinking of the superiority of one school over the other.

We are unable to state how this matter can be rectified. We are not inclined to place all the blame upon the Educational Council. Under the existing conditions it has acted in the most satisfactory manner, but that action has, nevertheless, resulted in great injustice to many Class B schools, and has given others in Class A, a rating which they are not justified in having when judged by results. However, this injustice will probably only be eliminated by Class B schools so arranging their administrative policies and teaching conditions as to meet with the requirements laid down by the Dental Educational Council of America.

The Normal and Pathological Histology of the Mouth*

SOME time ago there came to our desk for review two books by Arthur Hopewell-Smith, dealing with the "Normal and Pathological Histology of the Mouth." These volumes cover the histology of the teeth and supporting structures in such a complete manner that we thought it would be unfair to attempt to review them until we had made a careful study of both volumes, realizing a hasty review might be unfair to the author and also to the profession. After giving these books some study, we are convinced that they are a presentation of the subject in a much better and more complete manner than has ever been given before to the profession. While in some of the disputed points we may not exactly agree with the author, at the present time we are not in a position to absolutely prove that our views regarding development of some of the structures of the teeth are absolutely correct. The great difficulty in studying the development of the teeth and the supporting structures is that after specimens are prepared, cell metabolism has been absolutely stopped, and things may present a different appearance from what they really are. It is also very difficult to get a large number of embryos showing development at various stages, without which the chain of evidence is insufficient to establish the entire development of the study.

The first eight chapters of Volume I deal with the dental tissue. Chapter II is devoted to Nasmyth's Membrane, which has always been more or less of an elusive organ in the hands of a number of investigators. Its origin and function may still be considered to be a disputed point among histologists, probably because it seems to have no particular function, especially in man. So the question still remains as to whether it is a useful part of a tooth or whether it is an evolutionary tissue may have had some function in other types of development and tooth attachment than those found in animals today. Chapter III is devoted to the discussion of Enamel in a very complete manner, and shows a number of photographs which are superior to anything we have seen on this subject.

The dentine is treated in a much broader manner than is usually the case in works on Dental Histology, and the four varieties of dentine as recognized by comparative anatomists are mentioned. Chapter V deals with the Cementum,

*The Normal and Pathological Histology of the Mouth. By Arthur Hopewell-Smith, L.R.C.P., Lond., M.R.C.S., Eng., L.D.S., Eng., Vol. I, 345 pages, 262 illustrations; Vol. II, 477 pages, 394 illustrations. P. Blakiston's Son & Co., Philadelphia, publishers. Price \$4.50 per volume.

and is presented in the usual way by textbooks on dental histology. From studies of the cementum prepared by Dr. F. Hecker a few years ago, which were studied by the reviewer in conjunction with him, we question the origin of the cementum as outlined by Professor Hopewell-Smith, and some of the other dental investigators at the present day. The result of Dr. Hecker's investigation was published a few years ago in *The International Journal of Orthodontia and Oral Surgery*, and seems to be more in keeping with the physiology and pathology of the structures as found in clinical practice than the origin of the tissues as outlined by the majority of the investigators at the present time.

Three chapters of Part II of the first volume are devoted to the consideration of the oral tissues, which, of course, is very much the same as found in any other textbook on Histology.

Part III of Volume I is given over to the Histogenesis of the Teeth of Mammals, Fishes and Reptiles, which is a subject that is not found in the average book on dental histology, but which has a great bearing upon the development of the teeth and is very important so far as the proper understanding of the subject is concerned.

Volume II of the work is devoted to Pathological Histology and is a valuable addition to dental literature. It is a subject which as a rule has not been given the consideration due it. The second volume is arranged along the same general plan as the first volume, Part I covers the pathological conditions of the dental tissue, taking up the pathology of the enamel, dentine, and cementum. Dental Caries is treated in one chapter, while Disease of the Dental Pulp is taken care of in five chapters and is handled in a very complete manner. Three chapters are devoted to pathological conditions of the Alveolar Dental Periosteum, or the so-called Peridental Membrane. One chapter is devoted to consideration of "Pyorrhea Alveolaris" with quotation marks.

Part II which covers five chapters is given over to the consideration of the Pathological Conditions of the Oral Tissue. Part III contains one chapter under the title of Extra-Oral Dental Tissues, dealing with dermoid teeth or teeth developed in Teratomata. The second volume, as the first, is illustrated by a large number of microphotographs, which makes the work one of the most complete we have ever reviewed on this subject. Professor Hopewell-Smith's association with the research laboratories at the University of Pennsylvania gives him the opportunity to examine a large amount of material under the most favorable conditions.

We know of no work on the subject that would be a more valuable addition to the library of any one interested in this scientific subject.

A Practical Treatise of Fractures and Dislocations of the Jaws*

A PRACTICAL Treatise of Fractures and Dislocations of the Jaws" is the title of a monograph prepared by Chalmers J. Lyons, D.D.Sc. The book is arranged for students and practitioners. This work is dedicated to Dr. Cyrenus G. Darling, who has done much for the advancement of oral surgery in the Uni-

*A Practical Treatise of Fractures and Dislocations of the Jaws, for Students and Practitioners. By Chalmers J. Lyons, D.D.Sc., Professor of Dental Surgery, University of Michigan. Ransom & Randolph Co., Toledo, Ohio, Publishers, 102 pages, 114 illustrations. Price \$2.00.

versity of Michigan. The introduction covers the literature of ancient times in relation to the dislocations and the fractures of the jaws. In Chapter I we find the definition and classification of dislocations, including etiology, symptoms, and treatment. Chapters II, III, IV, and V are given over to the consideration of the fractures of the jaws and various types and varieties of fractures, their signs, symptoms, and diagnosis. The use of the x-ray in diagnosis and treatment is also taken up. Chapter X is devoted to the consideration of Gunshot Fractures and the various methods employed by the different men in the treatment in the service. Chapter XI takes up the Treatment of Bone Graft, which gives the history and fundamental principles of treatment, the description of Albee's method, also that of Gallie and Robertson. Chapter XII is devoted to Anesthesia in the Reduction of Fractures, which closes the monograph in a most complete and satisfactory manner. The book contains 102 pages and 114 illustrations.

We know of no other work on the subject which gives a more concise and complete exposition of the subjects than Dr. Lyons' work.

Everyday Mouth Hygiene*

"EVERYDAY MOUTH HYGIENE" is the title of a book written by Joseph Head, M.D., D.D.S., of the Jefferson Hospital, Philadelphia, Pa. The book is exactly what the title indicates. It is devoted to the importance of dental hygiene and gives a description of the manners in which certain infections may occur from oral uncleanness, and also proper means of cleansing the teeth. A great deal of importance is laid upon the proximal contact of the teeth, and the proper use of the floss silk in such a manner as to avoid injuring the gum, and also be sure of thoroughly cleansing the proximal contact and embrasure surfaces of the teeth. A number of original illustrations are published, showing the proper use of the floss silk, which should be of great benefit to individuals not familiar with this important means of cleansing the teeth. The question of the proper use of the toothbrush is also discussed, with original illustrations showing the use of the brush both in the mouth of the patient and upon a skull. The book also contains a short chapter upon the irregularity of children's teeth in which it emphasizes the importance of early treatment and the correction of irregularity from a prophylactic and hygienic standpoint. The work is one which the laity should be urged to read, and it would be a good book to recommend to all who are interested in mouth hygiene.

**Everyday Mouth Hygiene.* By Joseph Head, M.D., D.D.S., Dentist to the Jefferson Hospital, Philadelphia. W. B. Saunders Co., Philadelphia and London, publishers, 67 pages, 39 illustrations. Price \$1.00.

ORTHODONTIC NEWS AND NOTES

The editors desire to make this department a permanent feature of the Journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

Twentieth Annual Meeting of the American Society of Orthodontists

The Twentieth Annual Meeting of the American Society of Orthodontists will be held at the Edgewater Beach Hotel, Chicago, Ill., Monday, Tuesday, and Wednesday, April 5, 6, and 7, 1920. A splendid program, including clinics and case reports, has been arranged by the Board of Censors.

Alumni Society of Dewey School of Orthodontia

The next annual meeting of the Alumni Society of Dewey School of Orthodontia will be held April 1, 2, and 3, 1920, at the Edgewater Beach Hotel in Chicago. All interested in orthodontia are cordially invited to attend these meetings. Address all communications to the Secretary, Dr. George F. Burke, at 741-43 David Whitney Building, Detroit, Mich.

American Institute of Dental Teachers

At the annual meeting of the American Institute of Dental Teachers, held in Detroit in January, the following officers were elected: *President*, Dr. Arthur D. Black, Chicago, Ill.; *Vice-President*, Dr. Guy S. Millberry, San Francisco, Cal.; *Secretary-Treasurer*, Dr. Abram Hoffman, Buffalo, N.Y.; *Executive Board*, Dr. A. H. Hipple, Omaha, Nebr., Dr. A. E. Webster, Toronto, Ont., Dr. E. D. Collidge, Chicago, Ill.

Abram Hoffman, Secretary,
381 Linwood Ave., Buffalo, N. Y.

Notes of Interest

Dr. H. D. Broadbent announces the opening of his office in the Schofield Building, Cleveland, Ohio, for the practice of orthodontia.

Dr. Leslie M. Christie announces the opening of his office at 710 Fourteenth Street, Washington, D. C., for the exclusive practice of orthodontia.

Dr. Martin Dewey, of 25 East Washington St., Chicago, Ill., desires to announce the opening of his eastern office in New York City at 501 Fifth Ave., for the exclusive practice of orthodontia.

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ORIGINAL ARTICLES

THE MUSCLES AND LIGAMENTS OF THE MANDIBLE AS RELATED TO CERTAIN FUNCTIONS AND DEVELOPMENT

BY MARTIN DEWEY, M.D., D.D.S., CHICAGO, ILL.

THERE is no bone of the body that is more influenced by the attachment of the muscles than is the mandible, neither do we find any bone that has such varying groups of muscles attached to it in relation to the origin, functions, and nerve supply. The mandible has often been classed as a bone of environment, and as a result of these environments various muscles have been brought to play to perform various functions, all of which have an influence upon the mandible. It must be remembered that the mandible of man is concerned in five functions: first, as an organ of mastication for the support of the teeth; second, in the act of respiration; third, in speech; fourth, in deglutition in conjunction of the hyoid muscles and muscles of the pharynx; and fifth, it has an esthetic function in that it forms the lower part of the face. It has attached to it various groups of muscles which can be grouped as muscles of mastication, respiration, deglutition, speech, and expression.

The muscles associated with the mandible also have a very widely distributed nerve supply, which, however, can be divided quite accurately into certain groups connected with some particular function. Briefly, we may say that the muscles associated with the mandible receive their nerve supply from the fifth, seventh, eleventh, and twelfth cranial nerves. It is well to remember that because of this wide distribution of nerve supply, certain groups of muscles may be particularly affected without any change occurring in other groups. For example, we may have lack of development in the muscles of expression, which are controlled or supplied by the seventh nerve, while the muscles of mastication which are supplied by the fifth nerve may have developed normally and be performing their proper functions.

It is also well to remember that none of the muscles associated with the

mandible play a direct part in holding or keeping the mandible in any definite position. The mandible is maintained in a certain position by the ligaments, the inclined planes of the teeth, and by atmospheric pressure, in which the muscles play an indirect part. In a consideration of atmospheric pressure we must remember that the muscles of expression and respiration as well as deglutition play an active part in producing atmospheric conditions in the nasal and oral cavity which hold the mandible in position. It is because of the difference in the atmospheric relations between normal and abnormal breathers that we find the mandible assuming two different degrees of development, one of which results in a normal occlusion, and the other in an abnormal development of the mandible.

In considering these muscles of the mandible, it is well to remember that

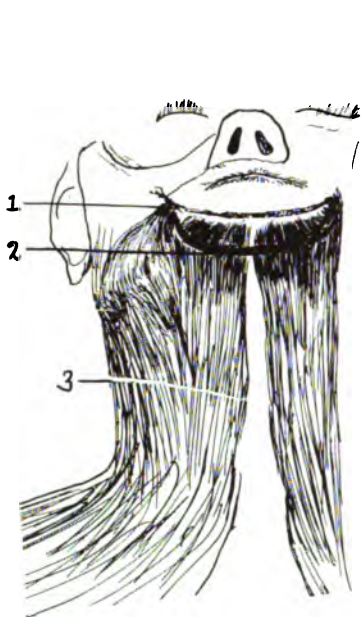


Fig. 1.

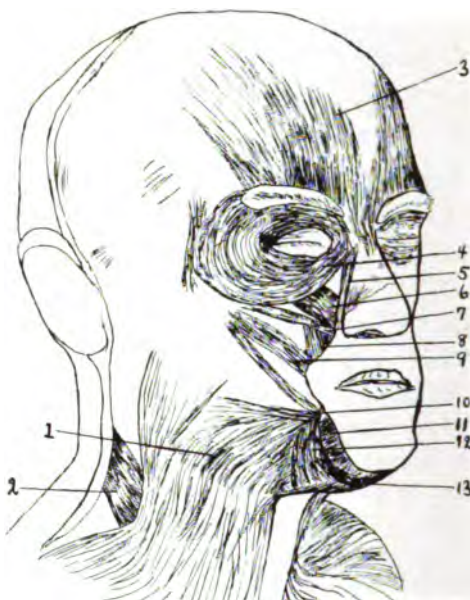


Fig. 2.

Fig. 1.—1. *M. triangularis*. 2. *M. transversus menti*. 3. *M. platysma myoides*.

Fig. 2.—1. *Platysma*. 2. *Sternocleidomastoideus*. 3. *Frontalis*. 4. *Orbicularis oculi*. 5. *Labii quadratus caput angulare (nasi)*. 6. *Caput infraorbit*. 7. *Zygomaticus minor*. 8. *Labii quadratus superioris*. 9. *Zygomaticus major*. 10. *Risorius*. 11. *Labii inferioris*. 12. *M. triangularis*. 13. *M. transversus menti*.

they have different nerve distributions that can also be separated and divided into groups and layers each one of which may be said to have certain definite and distinct functions from the others. We will consider them more in the order of their distributions rather than in the order of their importance. The external surface of the mandible, including the body of the mandible after the removal of the skin, will be found to be covered with a superficial layer of muscular fascia, which is composed of practically four muscles, some of which have been grouped by writers as a single muscle. We have first the platysma myoides which is a small flat muscle that is decidedly a muscle of expression, and has practically no influence upon the mandible (Fig. 1). Great importance has been laid upon this muscle by Dr. Rogers¹ as being concerned in the lack of development of the mandible in mouth breathers, but from actual dissections

and consultations of various anatomic authorities, we find that no one has considered the muscle of any importance in producing any change on the mandible, except Dr. Rogers.

The platysma arises from the superficial fascia which covers the clavicular part of the pectoralis major and deltoid muscles and is attached to the outer surface of the face and the inferior maxilla and the angle of the mouth where the fibers blend with anguli oris and orbicularis oris. The action of this muscle is to draw the angle of the mouth downward and outward, and, secondly, it may act as a feeble depressor of the mandible, and third, it raises and wrinkles the skin of the neck. The muscle does not really belong to the group known as a depressor of the mandible, but belongs to the facial muscles, which can be further understood when we remember that the nerve supply of the platysma is the inframandibular branch of the cervicofacial division of the facial nerve. Associated in this region with the platysma is the triangularis muscle which is flat and triangular and lies below the angle of the mouth and covers the foramen mentale. Its origin is just below the mental foramen and is inserted in the skin at the corner of the lip. Connected with the triangular muscle is the transversus menti which is made up of fibers that run from the platysma and join the fellow on the opposite side. The action of the transversus menti and the triangularis is to draw the corner of the mouth down and act as depressors of the upper lip. These muscles are also supplied by the facial nerve.

Fig. 2 also shows another muscle that may be considered as one of the facial group; namely, the risorius which has its origin from the masseter fascia, inserted at the angle of the mouth at the point of the insertion of the triangularis muscle. The risorius when acting alone draws the corner of the mouth backward and forms a dimple. It has often been called the "Laughing Muscle" and while being associated with the triangularis and transversus menti, it produces a directly opposite facial result. The risorius tends to denote an expression of pleasure, the action of the triangularis and the transversus menti by themselves drop the corners of the mouth producing a directly opposite effect, or one of sadness. The risorius is also supplied by branches of the facial nerve. These four muscles have very little direct action upon the mandible, but make up a portion of the superficial layer and are classed as muscles of expression because of the action and nerve supply. The platysma is the only one which has any fibers inserted directly into the body of the mandible, these fibers are of such small importance as to practically eliminate the platysma as a depressor of the mandible. However, in mouth breathing the inactivity of these muscles may have a detrimental effect in giving an unpleasing expression to the patient's face as is so often noticed in disturbed atmospheric relations.

Muscles of expression which play a part in the action of the upper lip and therefore become important factors in exerting an indirect influence upon the mandible in mouth breathers and abnormal lip habits, may be considered in groups according to their action. We find three muscles which may be termed the quadratus labii superioris made up of the three elevators of the upper lip and the nose; these muscles arise from a point corresponding to the nasal process of the maxillary bone; the maxillary bone in the region of the infraorbital foramen and the zygomatic portion of the maxillary. They all converge downward

and inward towards the sulcus nasolabialis, and in action draw the alæ of the nose and upper lip upward and outward. This group of muscles is supplied by the facial nerve. The zygomaticus major and elevator labii anguli oris arise, respectively, from the zygomatic region of the maxillary and the upper part of the canine fossa, are inserted into the angle of the upper lip and pull the upper lip and angle of the mouth upward. The zygomaticus major located still farther outward on the surface of the malar bone near the zygomatic arch runs downward and inward and is attached in the angle of the mouth to the lower border and the above-named muscles. All of these muscles are supplied by the facial nerve. Acting together they raise the upper lip. The quadratus labii inferioris can be mentioned with the depressors of the lips, with the transversus menti, and arise from the platysma region and are inserted at the border of the mouth and tend to draw down the corners of the mouth in an opposite direction to the muscles which have been previously named. The elevator mentalis shown

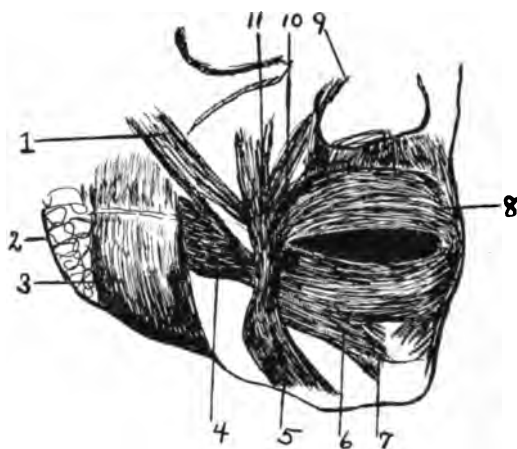


Fig. 3.—1. Zygomaticus M. 2. Parotid. 3. Masseter. 4. Buccinator. 5. M. triangularis. 6. M. incisivus labii inferioris. 7. M. mentalis. 8. Orbicularis oris. 9. Transversus nasi. 10. Labii superioris. 11. M. caninus.

in Fig. 3, arises from the incisal fossa of the mandible and is inserted into the skin of the chin. The action of this muscle is to raise the chin, as a result of which the lower lip is protruded.

The orbicularis oris is composed of fibers which surround the oral opening and which is contributed to by some of the fibers of all the muscles which have been mentioned and fibers which may be said to be common to the orbicularis oris alone. The orbicularis oris is a complex muscle consisting of three layers. The superficial layer is the prolongation of the fibers of the elevators and depressors at the angle of the mouth and extends as far as the center of the lip, but the fibers are not continuous to those of the opposite half. They are reinforced by the elevators of the upper lip and the zygomaticus, risorius, platysma and depressor labii inferioris. The middle layer is made up of the fibers derived from the buccinator. The deeper layer is composed of fibers which may be said to consist entirely of muscular fibers contributing to the orbicularis alone, and consists of two pairs of muscles associated with the upper portion, namely,

the *musculus incisivus* and *nasolabialis*. One pair is associated with the lower lip, known as the *musculus incisivus*, which arises from the incisor fossa of the mandible and turns outward blending with the other fibers mentioned. These various fibers are supplied with branches of the facial nerve and the action of the muscle is to close the oral opening and press the lip against the alveolar margin. The depressors and elevators of the lip as well as the *zygomaticus*, may be said to constitute the middle layer of the muscles of expression, the superficial layer being composed of the *platysma*, the *triangularis*, the *transversus menti* and the *risorius*. The middle layer is derived from the *buccinator*. The deep layer is the *musculus incisivus superioris* and *nasolabialis* and *musculus incisivus inferioris*, the last three pairs being already mentioned in conjunction of the *orbicularis*.

The *buccinator* muscle is much larger than any of the others which we have mentioned, with the possible exception of the *orbicularis oris* which was a blending of all the various muscles and fibers of expression, and we therefore feel the *buccinator* should be given more attention than we have paid to the other muscles. The action of the *buccinator* is little understood, and it has often been classed as a muscle of mastication and so considered by some anatomists. The *buccinator* belongs to the muscles of expression and becomes a muscle of mastication indirectly, only because it may be influential in keeping the food under the surface of the molars and premolars by contraction. It has no direct action on the movement of the mandible, although it is attached to both the mandible and the maxilla, which are considered points of origin. The *buccinator* rises from the outer surface of the alveolar border of the mandible and the maxilla opposite the molar teeth and a portion of the fibers arise from the anterior surface of the pterygo-mandibular ligaments. The fibers are inserted in the angle of the mouth and help to make up the middle strata of the *orbicularis oris*. It is supplied by the temporo-facial branches of the facial nerve, and by the buccal branches of the cervicofacial division. The nerve supply of this muscle therefore places it outside of the muscles of mastication which shows it is developed from the same structures that have made up the other muscles of expression. The action draws the angle of the mouth outward and presses the lips and cheeks against the teeth to force food under the masticating surfaces. The *buccinator* muscle is penetrated by the duct of the parotid gland as shown in Fig. 3.

It should also be remembered that all of these muscles of expression which are attached to the mandible are attached to the body of the mandible and none of them concerned with the opening or closing of the mouth. The muscles of mastication consist of four pairs of muscles, being four right and four left, all of which are inserted into the mandible and none of which have their origin or any fibers arising from the maxillary. These are the muscles which supply the movements of the mandible when the masticating or incisal functions of the teeth are being performed. We also find certain of these muscles are quite specialized in regard to their masticating functions, some more important than others, and as a result of this we find them developed in different degrees according to whether the incisors or molars are performing the greatest masticating functions. Fig. 4 shows the superficial portion of the *masseter* which arises from the anterior two-thirds of the lower border of the zygomatic arch and the

deep portion arises from the posterior third of the lower border and the whole of the internal surface of the zygomatic arch. The superficial portion of the masseter fibers are inserted in the lower half, the deep portion in the upper half of the outer surface of the ramus extending from the inferior border of the ramus to a point very close to the coronoid process. The action of the masseter is to close the mouth or move the mandible upward. It is particularly well developed in those animals which perform the masticating functions on the molars. It is therefore related to the occlusion of the molars and premolars. Fig. 4 also shows the origin of the temporal muscles in that it gives the extent of the temporal fossa which extends as high as the inferior temporal ridge of the frontal and parietal bone and as low as the infratemporal crest of the great wing of the sphenoid. The deeper fibers of the temporal muscles arise from the deep portion

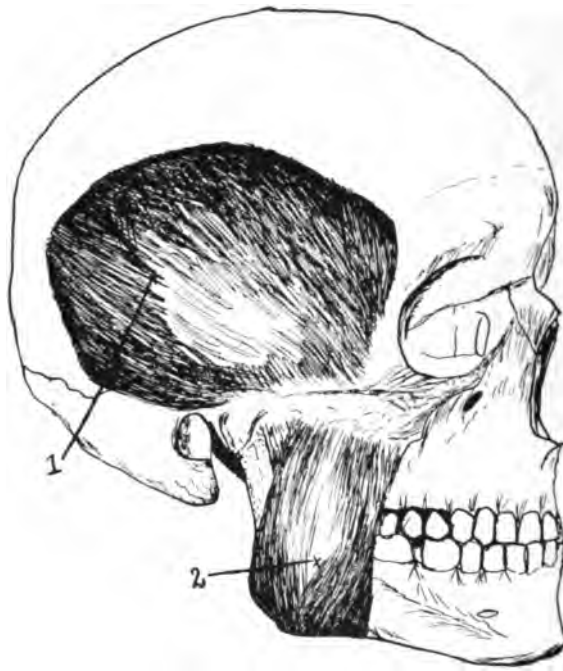


Fig. 4.—1. Fascia temporalis. 2. Masseter.

of the fossa, while the external fibers are, of course, attached to the temporal fascia. Fig. 5 shows the zygomatic arch removed and the gathering together of the fibers of the temporal muscles to be inserted in the coronoid process of the mandible. The action of the temporal muscle is to pull upward on the coronoid process, but owing to the wide origin of the fibers of the temporal, all of the fibers do not have the same action during mastication. In Fig. 5 it will be observed that the anterior fibers of the temporal run almost directly downward and become active when closing the mouth. The middle, posterior, and lower portion of the fibers of the temporal run downward and forward to the coronoid process, with the result that the action of the lower fibers will pull the mandible backward. When the mandible is protruded by the action of the external and internal pterygoid muscles to bring the edge of the incisors together for incision,

the middle and posterior fibers of the temporal acting on the coronoid process in conjunction with the anterior fibers pull the mandible backward and upward with sufficient force to perform incision. The action of the temporal muscle in moving the mandible posteriorly during incision is not very well understood by certain men in the profession. The use of the temporal muscle has been recommended as one of the important factors in muscle training in distocclusion cases.¹ There is no question about the value of the friction of the muscle during mastication as a means of producing development, but the action of the temporal muscle in a distocclusion case, especially the posterior and lower fibers, might be detrimental, as they would have a tendency to pull the mandible distally, which is the thing some men seem to want to avoid, especially where they be-



Fig. 5.—1. *M. temporalis*. 2. Zygomatic arch. 3. Parotid duct. 4. *M. Buccinator*. 5. *M. incisivus labii inferioris*. 6. *M. incisivus superioris*.

lieve they have moved the mandible forward in the correction of distocclusion. I very much doubt whether in the correction of a case of distocclusion any change occurs in the position of the mandible. I question the value of the action of the temporal in the retention of distocclusion cases, but also believe that no harm can result because of the fact that the mandible has not been moved forward in these distocclusion cases, which some men are inclined to think has occurred. If the mandible had been moved forward in the treatment of a distocclusion case, with the hope of keeping it forward, the muscular training and the education of the temporal muscle or continued use of the temporal muscle would be a detrimental factor because it would have a tendency to pull the

mandible distal to its old position. Both the temporal and the masseter are supplied by branches of the fifth cranial nerve.

The muscles of mastication, which are attached to the inner portion of the ramus, include the internal and external pterygoids. The action of these mus-

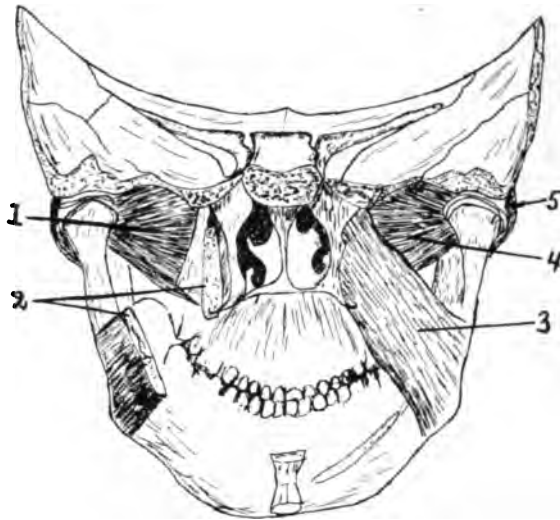


Fig. 6.—1. External pterygoid M. 2. Internal pterygoid M. (cut). 3. Internal pterygoid M. 4. External pterygoid M. 5. External capsular ligament.

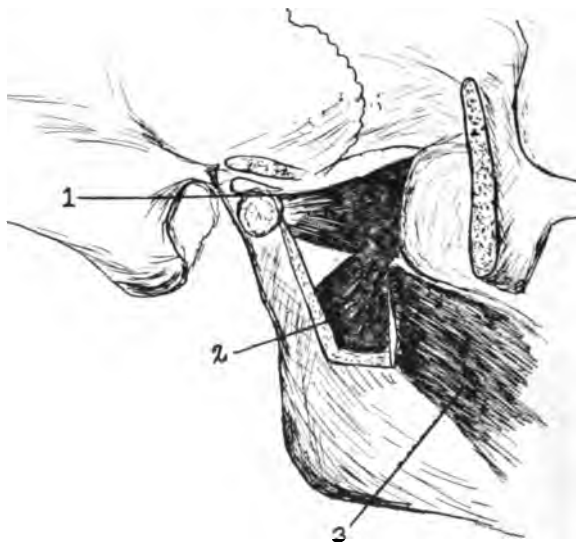


Fig. 7.—Pterygoid muscles, right side, external view. 1. M. Pterygoid externus. 2. Internal pterygoid M. 3. M. Buccinator.

cles is very little understood, judging from the various papers that have been published upon the subject in times past. Fig. 6, 7, and 8 show different views of the pterygoid muscles. These figures have been made with as little regard to other anatomic structures as was possible and still give their correct origin and

insertion. Fig. 6 shows that both muscles arise from the internal and external surface of the outer pterygoid plate of the sphenoid, extend backward and outward. The internal pterygoid runs backward, downward, and outward; the external pterygoid runs almost directly backward and outward without any downward tendency. The internal pterygoid is inserted in the inner surface of the ramus near the angle of the mandible and directly internal to the insertion of the masseter. Action of the internal pterygoid is to close the mouth by pulling upward on the ramus and also slightly forward. However, the muscle most active in protruding the mandible is the external pterygoid, which, when acting on the right and left sides, moves the mandible forward. If the external pterygoid acts on one side alone in conjunction with the internal pterygoid on that side, the mandible will be swung forward and laterally with the result that the entire mandible will be shifted toward the opposite side as far as the temporomandibular ligament will allow it to be shifted. In the movement of the human

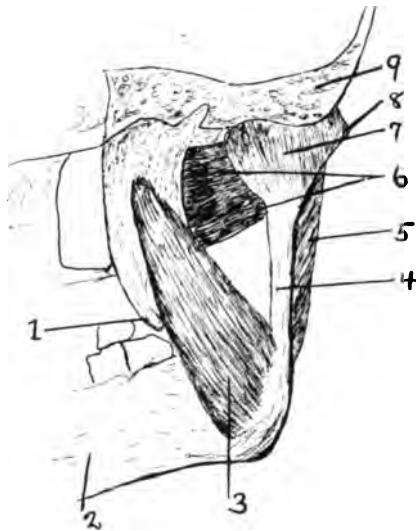


Fig. 8.—1. Hamulus pterygoideus. 2. Mandible. 3. Pterygoid internus. 4. Ramus mandibulæ. 5. Masseter. 6. Pterygoid externus. 7. Condyle. 8. Zygomaticus. 9. Os temporale.

mandible, the mandible does not rotate on the opposite condyle and the glenoid fossa because of the fact that the pterygoid muscles running backward and outward will necessarily produce a lateral shifting if only one muscle acts at a time. This lateral motion of the mandible is limited only by the length of the temporomandibular ligaments. Fig. 7 shows the zygomatic arch and a portion of the ramus of the mandible removed in order to give an external view of the external and internal pterygoids which have been called the internal muscles of mastication. In Fig. 8 the internal pterygoid plate of the sphenoid has been removed in order to show the origin of the internal pterygoid and the internal surface of the external pterygoid plate. The pterygoids are supplied by branches of the fifth cranial nerve.

It will be observed that all of these muscles attached to the ramus have action which moves the mandible forward, backward or upward. None of these muscles are so attached as to open the mouth, consequently the downward

motion of the mandible has to be supplied by another group of muscles which has been termed depressors of the mandible or elevators of the hyoid. Therefore the muscles associated in depressing the mandible have a twofold action. For example, if the mandible is held in position by the muscles of mastication, then those muscles which originally depressed the mandible become elevators of the hyoid. And in order for the mandible to be opened, a group of muscles which are known as the depressors of the hyoid have to be active and fix the hyoid bone so the elevators of the hyoid can depress the mandible. Consequently, the opening of the mouth is quite a complex proposition, because it calls into play the use of muscles which have other purposes than that of depressing the mandible.

Fig. 9 is the anterior view which shows the groups of muscles, concerned in depressing the mandible. This view includes a large number of the muscles of the neck. For purposes of relation the sternocleidomastoid is shown (Fig. 10) as arising from the sternum and the sternoclavicular articulation extends upward and backward, to be attached to the mastoid process of the temporal bone. This muscle is not concerned in the movement of the mandible, only in drawing the head downward and forward or when acting single in rotating the head. The sternocleidomastoid may be considered as a superficial muscle of the neck, along with the platysma, which has been removed.

The muscles indirectly concerned in the opening of the mouth because they are attached to the hyoid bone are the omohyoid and the sternohyoid. Also attached to the hyoid bone we have the thyrohyoid which becomes a depressor of the hyoid bone, because of the fact that the sternothyroid is inserted below it, and when the sternothyroid fixes the thyroid, the thyrohyoid becomes a depressor of the hyoid bone. We have four muscles which may be considered as active factors in the depressing of the hyoid bone or in fixing hyoid bones so the elevators of the hyoid become depressors of the mandible. The omohyoid as shown in Figs. 9 and 10 arises from the upper border of the scapula and is inserted in the outer third lower border of the hyoid bone, immediately external to the insertion of the sternohyoid muscle. This muscle is supplied by fibers of the hypoglossal nerve. The sternohyoid arises from the sternum and extends upward to the hyoid bone inserted into the hyoid at a point internal to the insertion of the omohyoid. This muscle and the omohyoid are the two long muscles which depress the hyoid bone and fix it in conjunction with the two short muscles, namely, the sternothyroid and the thyrohyoid. The lower portion of the sternothyroid is shown in Fig. 9, which extends from the sternum to the thyroid cartilage. The thyrohyoid is better shown in Fig. 10 where it extends from the hyoid bone at its insertion and has the origin at the thyroid cartilage. All of these muscles are supplied by branches of the hypoglossal or twelfth cranial nerves.

We have called attention to the fact that there are practically four muscles which are concerned in the fixation of the hyoid bone known as depressors of the hyoid which are also concerned in opening the mouth. In the region above the hyoid bone and between the mandible we also find four muscles, three of which again are directly attached to the mandible, while one is only active in elevating the hyoid. The digastric which is shown in Figs. 9, 10, and 12 is so

named because it is a double-bellied muscle, the posterior belly of which arises from the digastric fossa of the temporal, extends forward to the hyoid bone where it is bound down by the fascia of the stylohyoid muscle. That point is also the insertion of the anterior belly, the origin of which is the digastric fossa found on the internal surface of the mandible. While this muscle is named as a double-bellied muscle because of the insertion of the anterior and posterior belly into the hyoid bone, it is in reality the fusion of two muscles as shown by the nerve supply. The posterior belly of the digastric is supplied by a branch of the facial nerve, which therefore according to nerve supply is related to the muscle of expression. The anterior belly is supplied by the mylohyoid division of the inferior dental, which associates it more intimately with the mandible

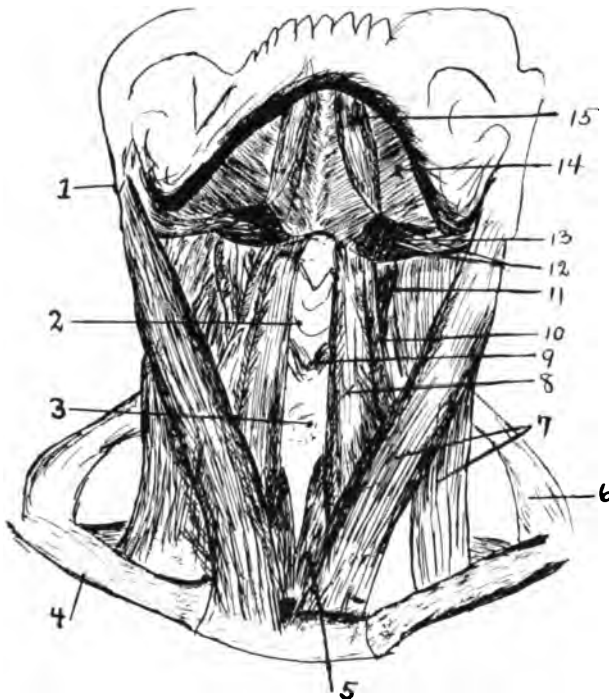


Fig. 9.—1. Mastoid process. 2. Thyroid cartilage. 3. Thyroid. 4. Clavicle. 5. Sternothyroideus. 6. Trapezius. 7. Sternocleidomastoideus. 8. Sternohyoideus. 9. Cricothyroideus. 10. Omohyoideus. 11. Thyrohyoideus. 12. Stylohyoideus. 13. Digastric muscle, posterior belly. 14. Mylohyoideus. 15. Digastric muscle, anterior belly.

than with the hyoid bone, and while it is classed as an elevator of the hyoid, it is in more reality a depressor of the mandible, that being the direct action of the anterior belly as shown by the origin, insertion, and nerve supply. The stylohyoid muscle which is shown in Figs. 9, 10, 11, and 12, arises from the styloid process of the temporal bone and is inserted in the anterior surface of the hyoid at the junction of the body and great cornu. This muscle like the posterior belly of the digastric is supplied by the facial nerve and consequently more intimately associated with muscles of expression than that of the hyoid or mandibular group.

The third muscle of this group, the mylohyoid which is shown in Figs. 9,

10, 11, 12, and 14 is a double muscle, which is united at the median line to form the diaphragma oris. It arises from the internal oblique ridge of the mandible and is inserted into the anterior surface of the hyoid bone. The

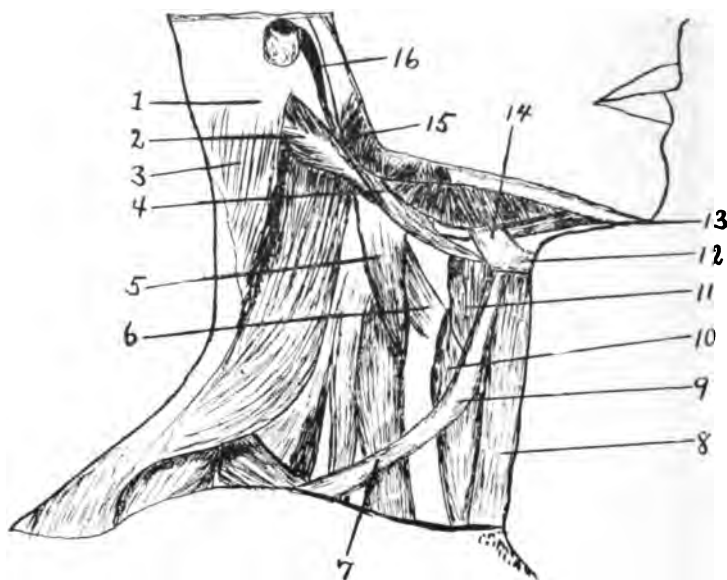


Fig. 10.—1. Styloid process. 2. Masseter. 3. Digastric muscle, posterior belly. 4. Stylohyoid. 5. Sternocleidomastoideus. 6. Trapezius. 7. Omohyoid. 8. Sternohyoid. 9. Omohyoid. 10. Thyrohyoid. 11. Hyoid. 12. Digastric muscle. 13. Ramus.

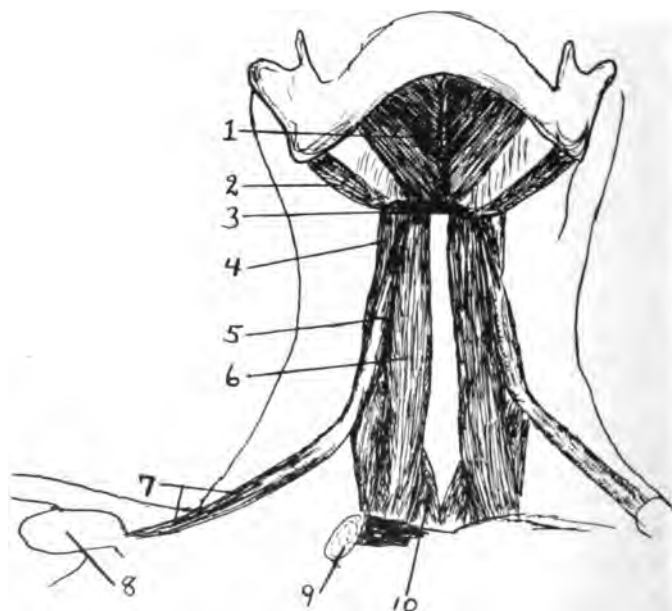


Fig. 11.—1. Mylohyoid. 2. Stylohyoid. 3. Hyoid. 4. Thyrohyoid. 5. Omohyoid. 6. Sternohyoid. 7. Omohyoid. 8. Scapula. 9. Clavicle. 10. Sternothyroid.

general direction of the fibers are downward and inward. The muscle raises the floor of the mouth and when the mandible is fixed, elevates the hyoid and

draws it forward. When the hyoid bone is fixed, it depresses the mandible. The nerve supply is the mylohyoid branch of the fifth.

Fig. 13 shows the manner in which the sternothyroid arises from the sternum and is inserted into the thyroid cartilage, the action of which is to depress the thyroid cartilage. This muscle is also a depressor of the thyroid bone and as such, also becomes a depressor of the mandible by the extension of the thyro-hyoid from the thyroid cartilage to the hyoid bone. Fig. 13 shows what might be called the deeper layers of muscles in the hyoid region, but also concerned as depressors of the mandible. Fig. 14 is made to show the arrangement and direction of the fibers of the mylohyoid and the geniohyoid from the mandible to the hyoid bone. These muscles also form the floor of the mouth and are influential in mouth-breathing.

Figs. 15 and 16 show the ligaments associated with the mandible, the purpose of which is to limit the extent of the mandibular movement as the result

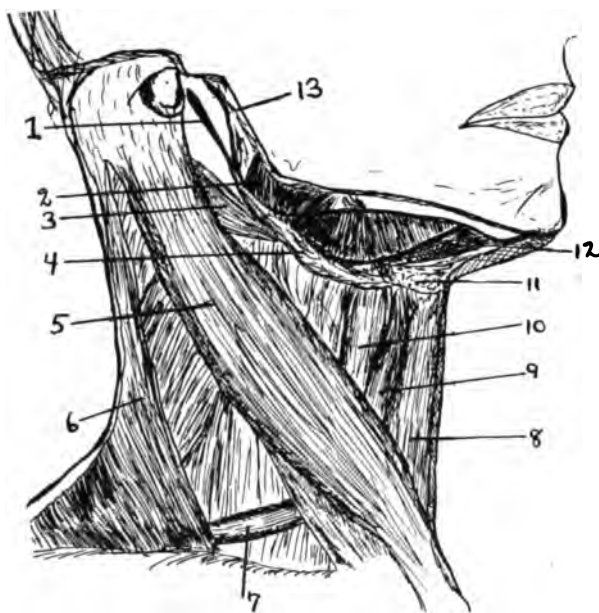


Fig. 12.—1. Mastoid process. 2. Digastric muscle. 3. Splenius capitis. 4. Stylohyoid. 5. Longus capitis. 6. Constrictor pharyngis inferior. 7. Omohyoid. 8. Sternohyoid. 9. Omohyoid. 10. Sternohyoid. 11. Thyrohyoid. 12. Hyoid. 13. Digastric muscle, anterior belly. 14. Loop for digastric muscle. 15. Masseter. 16. Styloid process.

of the action of the various muscles. Fig. 15 shows the temporomandibular ligament or what is often called the external capsular ligament which is attached into the outer border of the glenoid fossa and inserted into the neck of the condyle below the articular cartilage. It completely surrounds the head of the condyle, attached to all sides of the glenoid fossa. The outer fibers are the stronger, the majority of which run downward and backward. This ligament limits the forward movement of the mandible as a result from the action of the external and internal pterygoids, and also limits the lateral movement of the mandible on the right side when the pterygoid muscle on the left side are contracting alone to shift the mandible laterally. When the posterior fibers

of the temporals contract or when the lower fibers of the temporal act during the act of incision after the mandible has been moved forward to place the edge of the incisors together, these fibers of this ligament also limit the backward action of the lower fibers of the temporal. Owing to the direction in which the stylomandibular and sphenomandibular ligaments run downward and forward, as the mandible is protruded by the action of the pterygoids there is necessarily a tendency for the condyle to move upward as these ligaments assume a different angle. When the mouth is opened to its extreme width by the action of the depressors of the mandible which include the anterior belly of the digastric, the geniohyoid and the mylohyoid; the mandible first starts

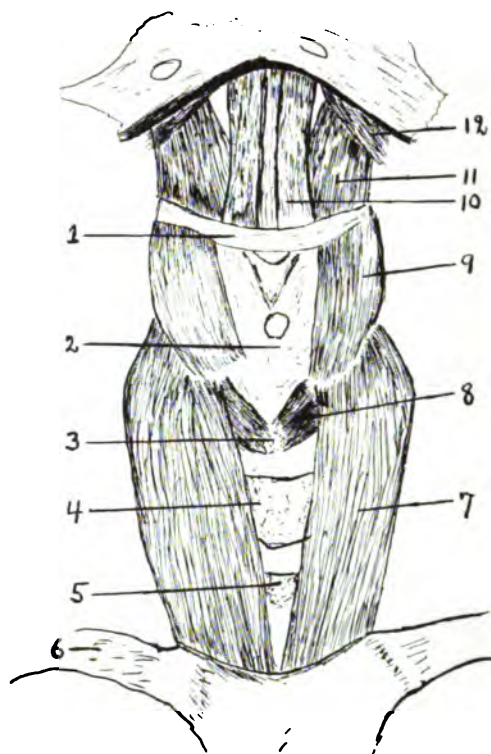


Fig. 13.—1. Os hyoidei. 2. Thyroid cartilage. 3. Cut cricoidea. 4. Thyroid gland. 5. Trachea. 6. Clavicle. 7. Sternothyroid. 8. Cricothyroideus. 9. Thyrohyoideus. 10. Geniohyoideus. 11. Hyoglossus. 12. Styloglossus.

to open with the temporomandibular articulation as the hinge point after the stylomandibular and sphenomandibular ligaments become tight: then the opening movement of the mandible is continued by the attachment of the stylomandibular and sphenomandibular ligaments on the mandible becoming a limiting point. The condyle then moves forward as far as allowed to by the temporomandibular ligaments, at which point the opening of the mouth is stopped.

We have called attention to the different groups of muscles attached to the mandible, of which there is a group of four, all of which are concerned in the acts of mastication. The group of four is located in the suprahyoid region, three of which are depressors of the mandible and one of which is only an

elevator of the hyoid bone; namely, the stylohyoid. We have four infrahyoid muscles which connect the hyoid bone to the suprahyoid region and depress the mandible, two of those muscles extending from the sternoclavicular region to the hyoid bone, one extending from the thyroid cartilage to the hyoid bone, which, however, becomes a depressor of the hyoid, owing to the fact that the fourth muscle in the group extends from the sternum to the thyroid cartilage. The four muscles of mastication, which are supplied by the fifth nerve and are attached to the ramus, are the least affected by maldevelopment or environmental changes and conditions. Of the various types of malocclusion that we encounter, with over- and underdevelopment of the mandible, we find that region to which the muscles of mastication are attached more often normally developed than any other part of the mandible. The action of the muscles of mastication is nearly always normal, in fact they are always normal in regard to the direction, but

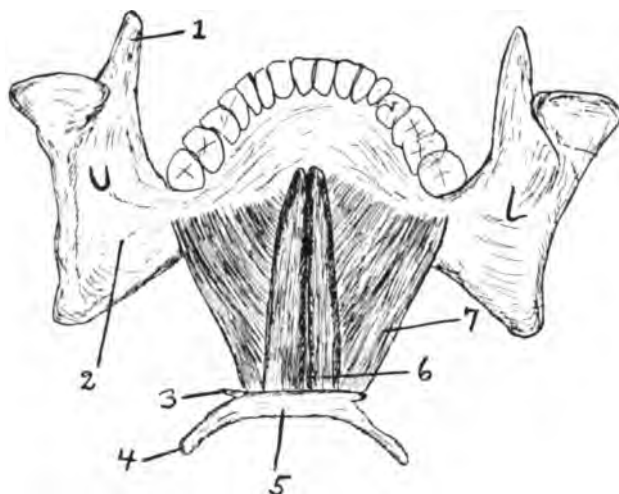


Fig. 14.—1. Coronoid. 2. Ramus mandibulæ. 3. Cornua minora. 4. Cornua majora. 5. Hyoid. 6. Geniohyoideus. 7. Mylohyoideus.

they may not exert as much pressure as is desired in certain types of malocclusion. The muscles of mastication have long been accused of producing deformity of the mandible in rachitic individuals, which statement has been doubted by Dr. Hatfield.² The writer is still of the opinion that mandibular deformity in rickets does occur from the action of the mandibular muscles. Hatfield contradicts the theory upon the basis that physiologic use of an organ tends to produce normal development, therefore the action of the muscles of mastication would tend to produce a normal development of the mandible. This theory would be true if Hatfield did not forget that in rickets there is a pathologic condition of the mandible in extreme cases, which results in an abnormal development or a failure of response to the mechanical stimulation such as would obtain in a normal individual. Consequently with the mandible in an imperfectly calcified state and the individual attempting to masticate on the teeth, we find the mandible assumes an obtuse angle between the ramus and the body.

Rogers has also stated that the pterygoid muscles should be exercised in

distoclusal cases with the idea of moving the mandible forward. This theory is open to criticism upon the grounds that it must first be proved that in distoclusion cases the mandible needs to be moved forward. In other words, if a distoclusion case is a result of posterior position of the condyle in the glenoid fossa, then the action of the pterygoids in moving the mandible forward would be a desirable condition. But, it must be further remembered that muscular action does not hold the mandible in position; so, no permanent results could be expected from the action of the pterygoids in keeping the mandible in a new position. The mandible is held in position by the force of the inclined plane and the atmospheric relations, not by muscular activity. The beneficial results which occur from the exercising of muscles in cases of malocclusion do not result from the fact that the muscles hold the mandible in position, but the use of these muscles simply create physiologic growth and development which becomes beneficial through the inclined planes of the teeth performing the functions in their proper positions. Rogers has recognized this factor because he states that in no disto-

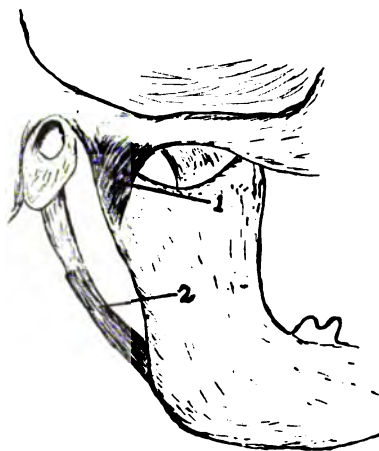


Fig. 15.—1. Temporomandibular ligament. 2. Stylomandibular ligament.

clusion case should exercise of the masseter and the temporal be employed until the cusps of the teeth are in proper position. As a result of this muscular exercise, instead of the mandible assuming a different position, it produces a growth and development which overcomes the deformity and thereby gives a beneficial result which Rogers seems to think has been obtained by changing the position of the mandible.

The muscles most concerned in the direct movement of the mandible are the four muscles of mastication; namely, the external and internal pterygoid and the temporal and masseter. The various movements which these muscles are capable of producing upon the mandible can be analyzed by remembering that the external pterygoid running from the external pterygoid plate to the head of the condyle (Figs. 6, 7, and 8) moves the mandible forward, and also provides for a lateral motion. When the right and left external pterygoid acts jointly, the mandible is protruded and the incisal edge of the incisors is placed in position. The mandible is then guided to a position of rest by the cusps of the teeth as the

result of the action of the lower fibers of the temporal muscles. By a careful study of the lower fibers of the temporal muscles and the direction of the fibers of the external pterygoid, it will be found that those muscular fibers run practically parallel to each other, or rather run in a parallel direction. The fibers of the external pterygoid run from the external pterygoid plate backward and outward to the neck of the condyle, and the lower fibers of the temporal run forward and inward on practically the same plane to the coronoid process. We may then say that the lower fibers of the temporal have a directly opposite action to the fibers of the external pterygoid. If the pterygoid on the right side act, the mandible is swung to the left and is brought back into position by the reverse action of the right temporal muscle, especially of the lower fibers. The masseter and internal pterygoid are useful in closing the mouth or bringing the teeth to occlusion when the teeth have been separated by the action of the anterior belly of the digastric and the geniohyoid. Fig. 4 shows the general direction of the fibers of

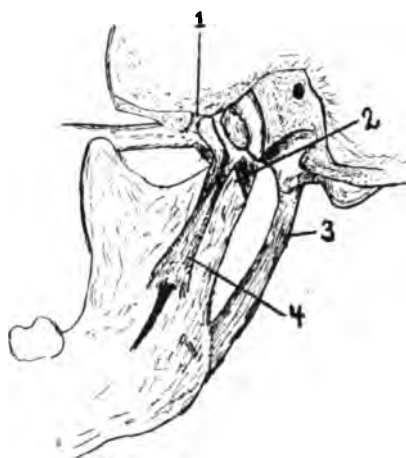


Fig. 16.—1. Temporomandibular ligament. 2. Temporomaxillary ligament. 3. Stylomandibular ligament. 4. Sphenomandibular ligament.

the masseter extending from the zygomatic arch downward to the lower border of the ramus. Figs. 9 and 10 show the direction of the anterior belly of the digastric from the hyoid bone to the base of the mandible, which is downward and backward from the mandible and very nearly parallel to the direction of the fibers of the masseter and internal pterygoid. It is the anterior fibers of the mylohyoid which are the most functional in opening the mouth. The geniohyoid is shown in Figs. 13 and 14 and also runs parallel to the anterior belly of the digastric and it may be considered that these three muscles, the mylohyoid, the geniohyoid and the anterior belly of the digastric are directly concerned in opening the mouth and work in an opposite direction to the temporal, the masseter and internal pterygoid. This belief is further strengthened when you consider that the four muscles of mastication attached to the ramus are supplied by the fifth nerve, and also those three of the suprahyoid group; namely, the mylohyoid, the geniohyoid and the anterior belly of the digastric are supplied by the mylohyoid branch of the fifth nerve. This group therefore may be considered depressors of the

mandible more than elevators of the hyoid, because they are supplied by the mandibular nerve.

Attention should also be called again to Figs. 15 and 16, which show the attachment of the three ligaments of the mandible which limits its various movements. It must also be remembered that the action of the muscles in mastication, as well as the muscles of expression, on the mandible, the teeth, and the supporting structures is that of stimulating physiologic development. The limitation of the movement of the mandible is governed by the ligaments, the temporomandibular, the stylomandibular and the sphenomandibular. When at rest the position of the mandible depends upon the occlusion of the teeth, upon the inclined plane of the teeth, and atmospheric conditions. As a result of the second statement, we have the solution of the beneficial results which have occurred in muscle training as outlined by Rogers, for the cusps of the teeth have been brought into play by the muscular action, which has resulted in the development of the parts supporting the teeth, and the mandible has assumed a certain relation because the cusps have been arranged to make that position possible; and, secondly, that position has been made permanent because the exercise of the muscles of expression has established the force of occlusion known as harmony in muscular action and atmospheric pressure. This harmony in muscular action has no influence upon holding the mandible, but simply of maintaining the buccolingual diameters of the dental arches as a result of the action of the tongue and the muscles of expression.

Rogers has likened the pterygoid muscles, especially the external pterygoid (which is the principal one to move the mandible forward) as the elastic rubbers of nature. This statement, while to a certain extent correct, is liable to misinterpretation, because the action of the external pterygoid does not produce such a movement as we hope to get with intermaxillary rubbers. If we admitted that in treating distocclusion cases we move the mandible forward instead of developing the body of the mandible, and that our results depend upon holding that mandible forward, then Rogers' statement would not be so liable to misinterpretation, but it would still be faulty. In the beneficial results which he cites in distocclusion cases where he has expanded the maxillary arch, and by the action of the external pterygoids placed the teeth in their proper position, those mandibles are not held in that position by the pterygoids. He follows the action of the external pterygoids in moving the mandible forward, by exercise of the masseter, internal pterygoid and perpendicular fibers of the temporals; which being attached to the ramus pull the cusps of the teeth into position, and stimulates growth of the body of the mandible in such a manner that the body of the mandible lengthens until a harmonious condition is again produced between the ligament holding the mandible in the region of the condyle and the cusps of the teeth.

In studying the musculatures of the mandible, one must consider the various groups of muscles and their nerve supply, and as a result of the knowledge of occlusion will arrive at the following conclusion: First, that various groups of muscles have certain movements which are again counteracted by other groups of muscles. Second, the mandible is not held in position by the muscles of mastication, but by the cusps of the teeth, atmospheric pressure, and muscular

harmony. Third, the limitations of the various movements of the mandible when the cusps of the teeth are separated is limited by the mandibular ligaments. The forces of occlusion, namely, the inclined plane of the teeth, harmony in the size of the arch, atmospheric pressure, and muscular pressure (and by muscular pressure we mean the pressure of the muscles of expression and the tongue) maintain the shape of the arches and the inclined plane and atmospheric pressure, when the other forces of occlusion are normal, hold the mandible in a definite position.

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PREVENTION VS. TREATMENT OF MALOCCLUSION*

BY S. LEWIS KREGARMAN, D.D.S., NEWARK, N. J.

IT IS not the good fortune of every essayist to present a paper essentially new in its interpretation of the questions involved. However, as long as there remains a need for reiteration of principles that are conducive to the public health and welfare, the essayist may be pardoned for a discourse that presents theories previously advanced by others.

Even though the movement for the general principles of prevention are progressing with unusual momentum, there is still evidence, here and there, of instances where propaganda is most necessary. Even in this age of our enlightened, boastful human intelligence, we do not fully appreciate the import of the word PREVENTION. Our knowledge and application of its true meaning is woefully lacking. When, however, it has become a part of the common mind of all the people, the present day neglect will appear extravagantly wasteful and crude.

It is assuredly the opinion of all present that in things pertaining to medicine or dentistry prevention is preferable to cure, for such is the true professional spirit. However, as incomprehensible as it may seem and contrary to the well-established beliefs of prevention in all other things, there is yet the opinion prevalent among many professional men of good training, high standing, and unquestionable ability, that when a malocclusion presents itself, if the patient be under twelve years of age to advise to "wait until all the permanent teeth are erupted and then have it attended to." How such opinions could have become the honest belief of these men is difficult of understanding, for I can not find any of the standard textbooks advocating such procedure. To quote, Angle says:

"The author is more and more impressed with the advisability of beginning the treatment as soon as the malocclusion is manifest. * * * Unless some unusual physical condition of the patient exists, it is unquestionably a serious mistake, and without the least argument in its favor, to defer the operation until the teeth have erupted, a time-honored custom still often advocated and followed by dentists."

Vernon Fiske says: "If other bones of the child's body are malformed, would you advise that the child wait until he becomes a man before making an effort to have the deformity corrected? Certainly not. Then why wait until the bones of the face are malformed?"

That is the trend of all authoritative advice, so we wonder how the idea, "to wait," became so widely adopted. A quarter of a century ago hardly any corrective measures were instituted in malocclusion except for practically adults. It was not fully realized that "the children of today are the adults of tomorrow," and at that time probably such procedure was excusable. But today, how can men mislead themselves and their patients into the belief that ulti-

*Read before the Northern Jersey County Dental Societies.

mately a malocclusion will correct itself, or be best treated after fully developed, or that a normal facial expression will obtain no matter at what age the treatment is begun?

In order to contradict such beliefs and dispel forever the continuance of such erroneous advice, educational propaganda must be carried to all the professional men and from them disseminated among the masses. It was not until the tuberculosis societies began propagating educational literature concerning the great white plague that much progress was made in the campaign to stamp out that disease. Does a tuberculosis pamphlet advise people to wait until one lung is gone and then give a lot of instructions and cures? Most emphatically not. The big thing is prevention. The best way to cure tuberculosis is not to get it, and so with malocclusion, the best cure is to prevent it.

So to be consistent it must be our endeavor to exert our influence upon the



Fig. 1.—Showing progressive stages of a developing malocclusion at five, six, and eight years of age. (Young).



A



B

Fig. 2.—Progress from six years of age to twelve years. A. Gives every indication of the condition to be expected at twelve. (Lischer).

growth of the child at the earliest possible age. The ideal physical condition of the child is the desire of every mother, and proper cooperation from the dentist toward that goal is welcomed and appreciated by them. One of the first steps we can take would be to educate society against a pernicious habit that is bound to keep recruiting the ranks of children with malocclusion,—bottle-feeding. The disastrous effects that sometimes occur as a result of raising a baby by artificial means is very evident to the observing orthodontist. Hellman and Wenker have found through investigations that 81 per cent of arrested jaw developments are found in the bottle-fed class. Proper feeding and proper dietary conditions in the young are most important to produce a state of normality of bodily function and structure that there is no room left for disease.

All pernicious habits should be detected early and steps taken for their correction. The child should be encouraged to use its teeth, tongue, jaws, and facial muscles in a manner not to deflect them from the channels of normal

growth and development. Thumb-sucking, lip-biting, etc., should be carefully guarded against.

I think probably it is a safe statement to make that there is no one here but would feel a sense of chagrin and great embarrassment, if, after he had treated a patient and dismissed the case as finished, the patient were to say, "Doctor, here is a cavity or two that you overlooked." I say it would be embarrassing. I think we should have an equal sense of embarrassment and feeling of lack of justice done to a child who has been under our care for some time when its parent calls our attention to the fact, "Doctor, I think my child's teeth need straightening." Surely the doctor is just as neglectful of his responsibility to that child as he would be to the other patient whom he was on the point of dismissing with cavities in the teeth. Whether or not the general practitioner ever practices orthodontia, it is essential for his professional reputation that he know the landmarks of normal occlusion and that he be able to recognize a deviation,

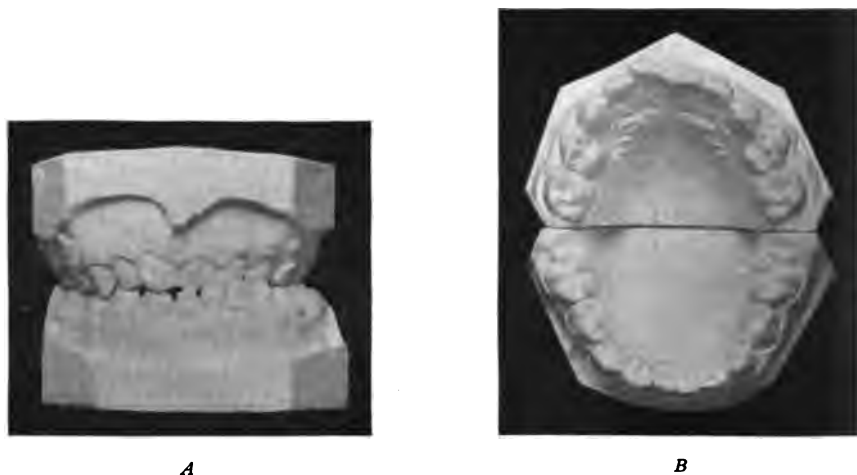


Fig. 3.—*A.* Crowded condition at five years. No space in the anterior region. Such condition positive to develop into a decided deformity. *B.* Note flattened condition of upper left, also lack of spacing.

or malocclusion, in its very incipiency,—that he guard against the premature loss of the deciduous teeth, and if one must be lost to maintain the space by artificial means to prevent the contraction of the arches,—that he guard against the prolonged retention of the temporary teeth, and guard the first molar from the ravishes of caries from the moment of its eruption until it is safe from decay caused by contact with the too often carious distal surface of the second deciduous molar.

It is true that nothing in nature is absolutely symmetrical,—nutrition, development, and habits govern the final results. When one thinks of the many changes occurring during dentition, and the liability to accident, faulty nutrition, and deforming habits, it is wonderful that nature unaided is so harmonious.

It is also true that, except in rare occasions, we find the individual who is blessed with the combination of health, beauty, and happiness. Among the many inborn rights of children are the rights to be, first, as healthy, and, second, as beautiful as nature and nurture will allow. These rights are as inalienable as

the right to be happy. Every mother desires such a combination for her child and would make any sacrifice that would lead to the consummation of this ideal. Certainly, the dentist can be of material assistance in regulating the physical and mental growth of every child that comes under his attention. By care and watchfulness the dentist can serve as the means of producing proper occlusion and consequently the possibility of better mastication, proper development of facial bones, and production of facial harmony, proper breathing with the attendant improved bodily development, the discontinuation of faulty and pernicious habits with the substitution of proper control and development of the facial muscles and a stimulation to increased mental activity.

First and foremost from a purely dental standpoint is the grave importance of normal occlusion. The law that, "the best balance, the best harmony, the best proportions of the mouth in its relations to the other features require that there shall be a full complement of teeth and that each tooth shall be made to occupy its normal position," is practically unanimously accepted by the orthodontists of today. The fallacious theory of "extraction to make room" was equally as harmful as the idea of waiting, and is very readily being discarded.

The position of each tooth and its occlusal relationship should be considered in other than an orthodontic significance by the dentist. Occlusion, although originally serving only as the basis of orthodontia, is now becoming recognized as the basis of all dentistry. As every tooth in each jaw is opposed by two approximating teeth in the other jaw, with the exception of the lower centrals and the upper third molars, if one is functionally disabled, it will similarly involve its antagonists. It is consequently quite plain that although one tooth constitutes a thirty-second part of the human adult denture so far as number is concerned, it represents a far greater quantity when its functional value is considered. As so aptly stated by Hellman, "The absence of a tooth breaks up the continuity in the series of elevations and depressions in the grinding plane of the denture and destroys the mutual support derived by the approximating contact, it also tends to allow displacement, or migration of the adjacent teeth and thereby further decrease functional efficiency."

Dr. Forest Orton, authority on crown and bridge work, recently stated that he considered occlusion the most important feature of that branch of dentistry, and holds that faulty occlusion is the cause of undermining an immense percentage of bridges. Periodontists are laying much stress upon the treatment of "traumatic occlusion" as being an important incident in insuring the proper co-ordination in function of the dental organs. That injuries to the alveolar process and to the attachment of the teeth are being produced as a result of irregular alignment and improper balance of stress is a question beyond argument, consequently that which naturally arises is the question whether or not the profession will persist in permitting such abnormalities to progress until these pathologic conditions are made more possible.

Still, at this point, it must be added, that normal occlusion with all its importance as a local factor, should be but a mere incident in outlining the plan of our treatment. The normal development of all the structures of the face, the nose, the jaw, the mouth, the teeth, muscles of mastication, muscles of expression,—all these form the true basis of orthodontia of today and all our diagnoses, all

our classifications, all our treatment and retention is based upon our knowledge of this much greater foundation.

It is very gratifying to note how both the rhinologists and orthodontists are realizing the importance of the diagnosis of adenoids and abnormal tonsils as an aid in preventive orthodontia. It is evident that it would be futile for us to zealously attempt corrective treatment of any case and neglect any one step that is necessary for success. Consequently the sooner we learn that no matter how much spreading of the arches we obtain, if the obstruction is allowed to remain in the postnasal region, our efforts are nil, and the rhinologist must learn that even though he remove the adenoids, if the development be already arrested in the maxillæ, the mouth-breathing condition will continue, unless orthodontic interference is begun. Certainly it is not necessary to draw the picture of a mouth-breather and dwell upon its pernicious effects. Suffice to say, defective breathing produces underdeveloped nasal passages, enlarged turbinates, deflected



A



B

Fig. 4-A.—Thumb and tongue sucking at three years. A positive indication of a future open-bite malocclusion unless prevented.

Fig. 4-B.—Occlusal view.

septum, maldevelopment of the face and entire body, a lowered vitality, in general a bearing down of the physical and mental forces of a child who might grow splendidly to a perfect fulfillment of his or her highest possibilities. Is it not then to be considered as a sacred privilege that within our realm of endeavor it is possible for us to spare children the evils that are positively in store for them unless our treatment is begun at the proper period? The question is, should we wait until we are positive the condition exists with all its damning evidence, or should we be capable of recognizing the menacing deformity years in advance of its climax?

The esthetic phase is by no means the most important, still it has been very tersely remarked that the outside of the face is the "mirror of the soul." It is now a recognized principle that the shape of the face depends on the second dentition. At birth we have very little face in comparison with the rest of the

head. This develops afterwards and does not reach its full development until about twenty. A slight deformity of any portion during its growth is likely to throw the other parts of the face out of line. Defects and faults are apt to enlarge with development and become less easily corrigible. Until the age of six the growth has been mainly in the cranial region but at this period the growth of the accessory sinuses begins, the nasal fossæ increase in height and the alveolar arches also enlarge. The face develops. It is dependent upon the size, shape, and location of the teeth to develop a harmonious composite facial form. The



Fig. 5-A.—Progressive stages at six, nine and twelve years. (Ferris.)



Fig. 5-B.—The condition at twelve should be expected when a crowded arch, as first figure represents itself at six. Malocclusion is always progressive.

alveolar process has no definition in life other than to serve as a passive shell and necessary support of the teeth. When any of the teeth are lost, in youth or in old age, the alveolar process at the spot or area where such a loss has occurred enters immediately upon the road of involution and complete disappearance. Without the teeth it does not develop, and when the teeth are lost, it disappears.

Singleton says: "Down the avenue they are selling false faces. How many people need to buy them? There are more real live false faces on the street than artificial ones in the store. How does anybody know? Look at their teeth. Does not the contour of the face depend on the bony framework that gives it

support and does not this underlying structure consist of the teeth and those parts necessary for their maintenance? People aren't born with false faces, but get them after they grow up and growing up with a motley array of human teeth in the mouth puts a cartoon on your shoulder instead of your natural face. Consequently every child with a malposed tooth is nursing the germ for his or her future cartoon, which will probably serve as a conspicuous credential in the struggle for existence."

Thus we see that bad habits, faulty development, obstruction, improper occlusion, and the development of a caricature for human features, can be avoided in the beginning. With no preceding teeth to influence it, the deciduous denture in the healthy child is usually regular in alignment and occlusion. However, should there be, from any cause, an irregularity in this denture, it is becoming more generally recognized, treatment should be instituted in the deciduous set as early as the age of the patient will permit the wearing of the delicate arches and bands. To those who cling to the doctrine to wait, this opinion may seem revolutionary or bolshevistic, but still it is very good practice.

It assuredly should be evident to one, not even versed in histology, how much more preferable it is to guide an erupting tooth into its proper alignment than to wait until a maldevelopment has been allowed to become fixed before attempting a correction. There is no attachment of the pericemental fibers to the enamel surface of the tooth and since the crown of the erupting tooth makes its appearance before the root is fully formed, it must be very evident that the pressure required to stimulate the cell activity necessary for the proper placement of such a tooth is much less than that required in a condition where the tooth was fully erupted, with surrounding bony formation fully developed. During the eruptive period much less pressure being necessary, more delicate appliances can be used, in fact, such delicate appliances that the little children suffer no inconvenience whatsoever. If the teeth are "guided" into their sockets, it tends greatly to eliminate the wholesome fear that men have for retention, for certainly establishing the normal relationship of the inclined planes with their antagonists as the original, or natural relationship, we eliminate the possibility of any "backward tendency" of those teeth to any abnormal position, since such a condition was never permitted to exist. Whereas, if treatment is begun on malposed teeth after the sockets are fully formed, the retention of those teeth after correction is one of the greatest problems facing the orthodontist today. Another item to be considered is the comparison of the physiologic strength of originally formed bone with that which is developed through stimulation. Dr. Young is of the opinion that teeth guided into position are surrounded with bone far more normal in cell activity and structure and therefore better able to withstand the invasions of disease, than where resorption of bone has been induced by mechanical means and the teeth held by some device until new bone has developed to sustain them."

An important bit of knowledge that all general practitioners should be occasionally reminded of, is that the child whose general development is normal will always show very slight spacing between the anterior teeth, at about 4 and 4½ years of age and then progress rapidly enough to provide the necessary room for the larger permanent teeth. If, however, a child's general develop-

ment is slower than the average, the spacing occurs at a correspondingly later time. The point to be made clear is that if the jaw development is clearly slower than the general development, and no spaces occur in the anterior region, one may invariably look for a malocclusion to result, unless interference is begun early.

We do not intend dwelling at length on methods of treatment. Children have no objection to wearing the improved appliances of today. This day of enlightenment in the science of orthodontia finds us all a unit in the belief that almost any infinitesimal force will move a tooth, consequently the use of light and delicate appliances. The simple lingual arches advocated by Dr. Lourie and Dr. Mershon, used in conjunction with the high labial arch are so delicate in construction that the tender age of the child does not enter into consideration. An importance hitherto unrecognized, but due to Dr. Roger's study is now attached to the proper balancing of the muscular forces of the lips, jaws, and neck and a most valuable adjunct to treatment is a series of systematic muscular exercises that are at times more effective than appliances.

In conclusion, we find that orthodontia is a prophylactic power in its bearing upon the prevention and correction of abnormalities of the face, mouth, and nasal cavities, and the respiratory, digestive and nervous systems. Children, the sufferers, are mentally and physically below standard. If not entirely prevented, these conditions should be recognized in their incipency and diverted into normal channels before being fully developed, and, that instead of beginning the treatment at the age of eleven or twelve, it is the very time that all cases should be completed.

DENTAL ENGINEERING

BY RUDOLPH S. HANAU, BUFFALO, N. Y.

IT IS regretted by the originator of Dental Engineering, that he has been so thoroughly misunderstood in many ways by numerous men in the dental profession.

It is suspected that a set-back has been given to the progress of dental engineering by commercially inclined individuals who have tried to use the same for private gain instead of the advancement of a science. That such men care not for ethics and do not respect science, and in consequence enunciate spurious claims, should not prevent a real searcher from making a most careful investigation. The latter must lay aside all prejudice when making his observations, and he must not forget to fill these gaps which may handicap his analytic reasoning.

Be it understood above all—dental engineering is not presented as a branch of a new religious creed, and therefore, it should not be subjected to *belief*. Furthermore it is not a patent medicine recipe or article, or even a patentable form of archform, determination, or art.

To orthodontists, it should be nothing but knowledge, and when understood, applied science. Orthodontists need dental engineering just as badly as chemists need physics; physicists, mathematics; and engineers, descriptive geometry. Each of the above-mentioned branches of science constitute but a fraction of those which a chemist, physicist, or engineer need, for their respective professions.

Dental engineering is not a substitute for pathology, morphology, anthropology, etc. It should be understood and applied together with these special branches of organized human thought.

An interesting paper by Dr. Hellman* tries to dispose of dental engineering in such a way that the writer of this article takes exception, only because it has many aspects typical of those which dental engineering has to combat. The essay most elegantly circumnavigates the issue, and, strange to say, lands in a common harbor with dental engineering. Dr. Hellman's argument hinges on the following four points:

First: That there is a definite relationship between the size of the teeth and the form of the dental arch.

Second: That by the employment of certain methods of calculation, using the dimensions of the teeth as a basis, a formula, diagram or plan of that form of the dental arch can be obtained in a case of malocclusion which nature would have produced had no interference occurred.

Third: That by following the procedure advanced, uniform success is assured in the treatment of every case of malocclusion.

Fourth: That the propounded methods are universal in their application.

To point one, dental engineering has this to say: *There does exist a relation between the human archform and the size of the teeth. The size and shape*

*Hellman: International Journal of Orthodontia and Oral Surgery, 1919, V, No. 11.

of the teeth are only two of the many factors that are responsible for a set dental arch.

Dental engineering ventures to conclude that the shape of the teeth has a greater influence upon establishing, or maintaining an archform, than the size (mesio-distally) of the teeth, and by reason of the fact that harmony has to be established for the size and shape of the teeth, their kinematic, physiologic, mechanical, and other functions, we are confronted with a problem that is still more complex.

To illustrate this contention, let us consider an apparently normal dentition

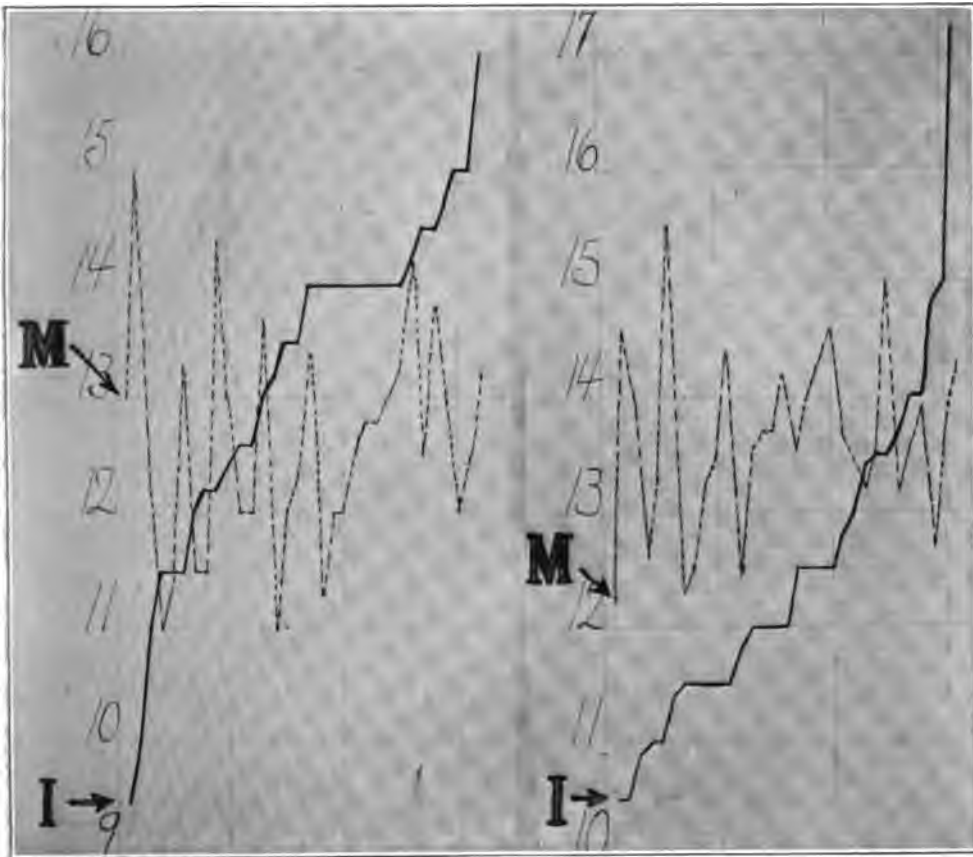


Fig. 1.

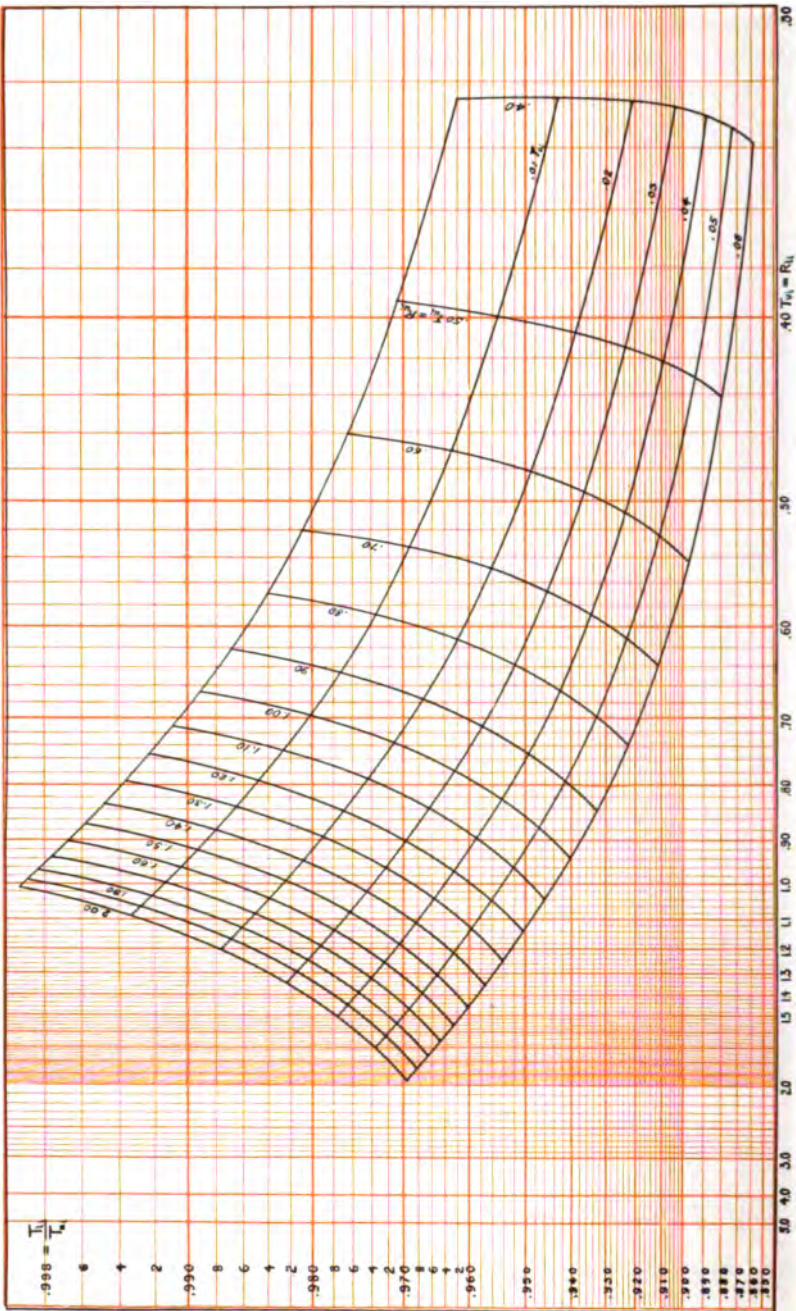
Fig. 2.

Fig. 1.—Illustrating curves based on the mesio-distal diameter of incisor and molars of the dentitions conforming to one arch outline, showing no correlation in the sizes of these teeth. Heavy line marked *I* indicates incisor curve, broken line marked *M*, molar curve. Numbers indicate dimension in millimeters.

Fig. 2.—Illustrating labio-lingual dimension of the central incisor and bucco-lingual dimension of the first permanent molar as in Fig. 1 showing no correlation. (Markings as in Fig. 1.) (Hellman.)

of a normal individual. For some reason or another, the second premolar crown was removed. If this mutilated tooth were properly rebuilt by tooth material, equivalent in size and shape to that to be replaced, then it will be safe to expect *no change in the arch form*.

On the other hand, should we not substitute the lost crown, then the arch *may retain its form*, thanks to the shape of the teeth, in spite of the loss of



FACTORS OF INCISAL RADII BY RUDOLPH L. HANAU.

Fig. 3.

human denture, and I am prepared to state that it also applies to anthropoid apes and other animals with *contact tooth formation and known interdigitation*.

The Figs. 5, 6, 7, 8, 9A, 9B, 15A and 15B of Dr. Hellman's article illustrate this contention.

The formula for anthropoid apes expressing the upper and lower tooth material beginning at the median line follows for symmetrical dentures:

$$2(C_u + L_u + mE_1 + E_u + B_u^1 + B_u^2 + M_u^1 + M_u^2 + M_u^3 + \dots) = T_u$$

$$2(C_l + L_l + E_l + B_l^1 + B_l^2 + M_l^1 + M_l^2 + M_l^3 + \dots) = T_l$$

CODE
APPERTAINING TO THE MATHEMATICS OF THE DENTURE

TOOTH	UPPER	LOWER
Central	C_u	C_l
Lateral	L_u	L_l
Cuspid (or Canine)	E_u	E_l
1st Bicuspid (or Premolar)	B_u^1	B_l^1
2nd Bicuspid (or Premolar)	B_u^2	B_l^2
1st Molar	M_u^1	M_l^1
2nd Molar	M_u^2	M_l^2
3rd Molar	M_u^3	M_l^3
Upper Tooth Material	T_u	
Lower " "	T_l	

wherein m expresses that portion of the entire lower canine width m that has to be considered for contact formation of the upper tooth material.

Dr. Hellman refers to interdigitation peculiarities of the dentures in question. Considering these, analogous laws apply to the denture of anthropoid apes and humans.

I also take exception to the types of arch forms, as well as the mode of classification. For the sake of completeness, I would suggest to consider the following differentiation in arch form: Fig. 5 and then to group the dentures, or parts thereof, in accordance with *the shape of the contact lines, instead of the cusp lines*, which apparently has been done.

The difference in arch form of upper and lower denture has been pointed out. That difference in arch form is an absolute necessity for occlusal contact and is mainly due to the bucco-lingual inclination of teeth. Dissimilarity or irregularity of the incisal portion of the human denture always constitute malocclusion in one form or another. Irregularities in the geometrical relation of the projection of the upper or lower compensating curves unfailingly point out defective occlusion, and if these curves are regular, and the distribution of the tooth material only is abnormal, then the curves represent a case of pseudo-occlusion.

Referring again to Dr. Hellman's four points of which 2, 3, and 4 are not settled, we ask, "Who still claims it?"

The doctor's conclusions from 1 to 10 are in no possible way interfering with or contradicting dental engineering. In fact they substantiate its results,

and give food and encouragement for further development of dental engineering.

Referring to a remark in the discussion by Dr. Dewey, the writer is somewhat embarrassed to mention it. Nevertheless, it may be in order to refer to it for the sake of mutual understanding. There is no excuse for a dental engineer not being able to lay out a denture for a skull or animal of which the laws of occlusion are known, but it must not be expected that the resulting denture resembles the actual denture more closely than our laws of occlusion resemble Nature's actual laws.

The issue condensed is this: either we accept the laws of occlusion, given by our dental authorities as correct, or we have to prove them wrong. Dental

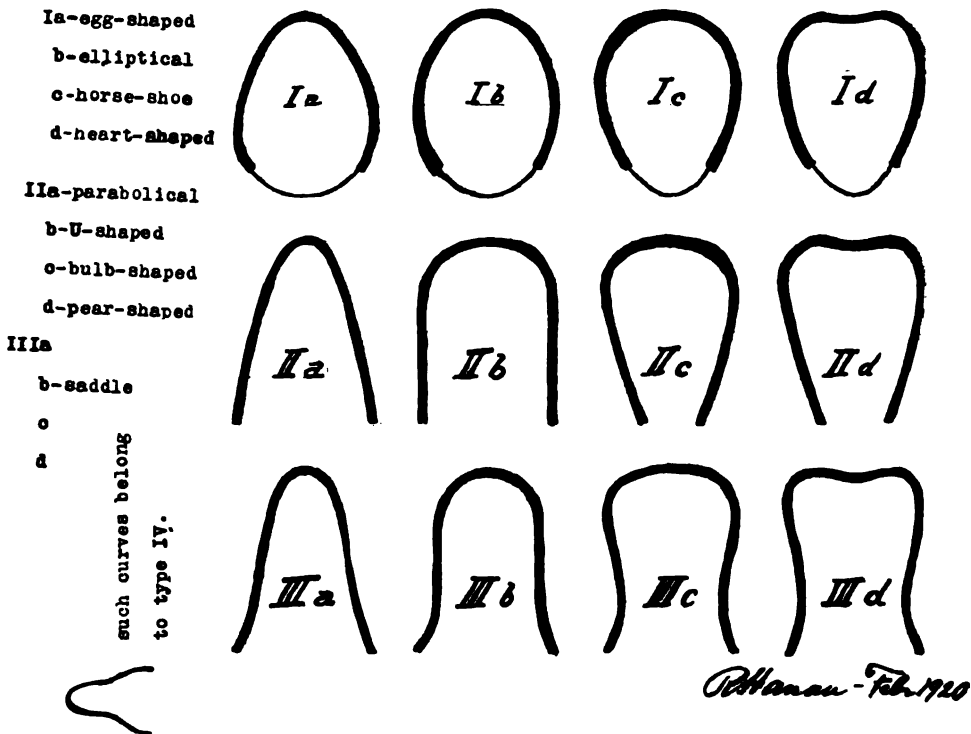


Fig. 5.

engineering accepts them as correct, simply because it could not improve them. Prominent orthodontists evidently believe in them, because they endeavor to apply them.

The open question in my mind is only, how can some orthodontists dare to apply purely geometrical kinematical and mechanical laws or rules, if they admit that they don't know, or don't care to know much about geometry. The laws of occlusion as they stand today are purely geometrical, kinematical, and mechanical, and crude at that.

(To be continued.)

DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

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DISEASES OF THE JAW—CASE HISTORIES

BY ARTHUR E. HERTZLER, M.D., F.A.C.S., HALSTEAD, KANSAS

CASE 1.—A veterinary surgeon consulted me because of a swelling of his face.

History.—Fifteen months ago he noticed a swelling in his lower jaw just back of his wisdom tooth. The jaw gradually swelled and became painful. After nine months a sinus formed in the skin just above and behind the angle of the jaw. A few months later a sinus developed an inch lower down the neck. During the past month the temple has swollen markedly and he has severe headaches. He has had no other sickness. He has consulted a number of surgeons who all diagnosed carcinoma.

Examination.—There is an ulcer on the alveolar border extending from the wisdom tooth upon the anterior pillar (Fig. 1). It has an overhanging edge and a granular base. The edge is very firm and feels carcinomatous, but on inspection there is proliferation of epithelium along the edge. The granular base can be made to bleed by manipulation. The bone is exposed at the base. According to his physician this ulcer has not changed in the past year. Because of the pronounced swelling of the jaw he is unable to open his mouth perfectly. The swelling of the cheek and temple is so great that the ear is elevated. The eye is likewise encroached upon. The openings above mentioned are crateriform and puckered with scar-like ridges leading out from them. When the swollen area is pressed upon a liquid pus exudes, carrying with it numerous flakes of a dirty greyish white color. The flakes showed filaments but no club-shaped forms. Some of the pus was injected into a guinea pig.

Diagnosis.—While the crater-like openings were distinctive of actinomycosis, there were no yellow granules. Furthermore the greyish flakes closely resembled those often seen in tuberculous pus. So firmly had the importance of the yellow character of actinomycotic granules been impressed on my mind that

this disease was excluded on this ground alone. The injected guinea pig died in thirty days and whitish nodules from 2 to 6 mm. in diameter were found on the peritoneum. This was regarded as confirmatory evidence of tuberculosis. It was only after these peritoneal nodules were sectioned that the fallacy was discovered.

Treatment.—General supportive measures were recommended.

After-course.—The head pains increased and he died thirty days after the first examination from a gradually increasing meningeal irritation.

Comment.—The local ulcerous lesion together with the swollen cheek with the puckered crater-like openings was pathognomonic. The fetish of the canary-colored granules prevented me from making a perfectly obvious diagnosis. The presence of the tubercles in the peritoneum made the confusion complete. At

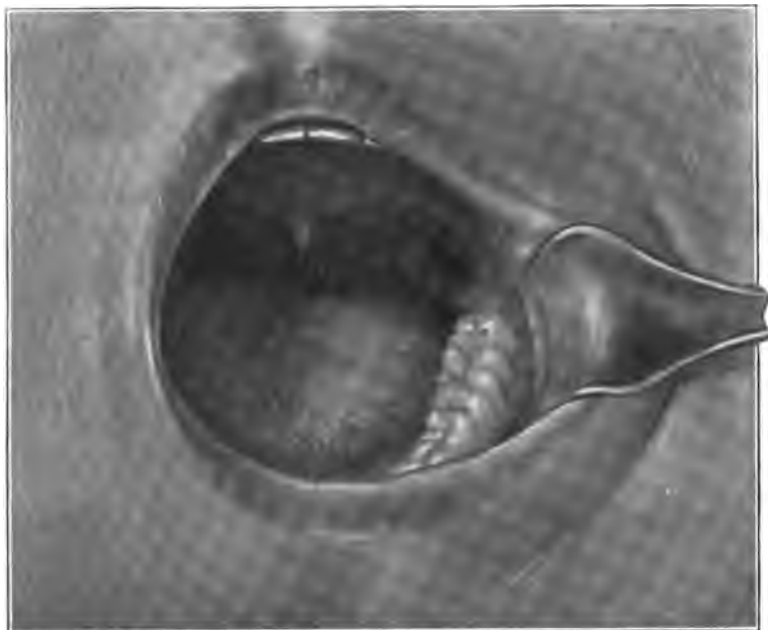


Fig. 1.—Actinomycosis of the jaw. (The artist failed to continue the ulcer down about the wisdom tooth.)

the time this patient was observed none of the inoculation experiments had been recorded in the literature. There are cases recorded identical with this which likewise were mistaken for tuberculosis because of the presence of greyish flocculi and the absence of yellow bodies. Whenever an ulcer of the jaw is accompanied by induration of the cheek, actinomycosis must be thought of, and if puckered crateriform openings are formed, the diagnosis is certain, irrespective of the character of the pus. Massive induration does occur in some carcinomas of the jaw with breaking down and the formation of sinuses, but in these there is no puckering about the opening.

CASE 2.—A man aged fifty came to the hospital because of swelling of the left side of his face, pain and difficulty in opening his mouth.

History.—His trouble started seven years ago when he was struck over the left side of the lower maxillary bone by a mallet used for driving railroad

spikes. Several lower teeth were loosened and he bled from the mouth. The pain never left, but continued to grow worse and after two years he had two teeth extracted from the lower jaw on account of the pain. The dentist said there was necrosed bone about the teeth. An incision was then made over the left side of the lower jaw and the necrosed bone was removed. Three months later when the wound had not healed, he consulted a surgeon who called it carcinoma and said there was nothing to do except to resect the jaw. He consulted another surgeon who agreed with this diagnosis and treated him with radium. The wound healed apparently perfectly after four months of radium treatment.

He had no further trouble until four years later when he had swelling and pain over the left antrum. Two upper teeth began to pain and these were pulled. The dentist at that time said he had antrum trouble. An opening was drilled through the alveolar process into the antrum which was treated by the dentist for a month. The condition did not improve.

Examination.—The patient presents an indurated swelling of the left cheek. It is thickened, indurated, almost hard to the touch and but little painful. It occupies the whole cheek from the zygomatic arch downward to the upper part of the neck. The whole cheek is twice its normal thickness. There is an opening into the antrum above and behind the canine tooth. Exposed spicules of bone present about the opening. There is no pus present. There is no general reaction of any kind.

Diagnosis.—The tissues above indicated presented the general appearance of induration. The necrosed bone seems to be the cause of the chronic irritation. It has all the physical characters of a woody phlegmon.

Treatment.—The exposed bone was removed. It was nowhere separated from the surrounding bone. No noteworthy improvement followed and he returned a year later in much the same condition. A similar incision was made and some dead bone removed from the alveolar process and a portion of the hard palate. The cavity was packed with gauze, which was removed on the same day. No improvement followed. He returned a year later and was operated again. An incision was made straight back from the left corner of the mouth through the cheek. A portion of necrotic upper maxilla was removed and the antrum found filled with a myxomatous looking tissue which was curetted out. The cavity was packed with gauze which was removed on the following day.

Pathology.—It was noted that the bone nowhere showed a disposition to separate from the adjoining unaffected bone. The soft tissues seemed to be separated from the bone, like gums from the teeth in pyorrhea. The tissue gave the general appearance of slowly developing granulation tissue.

After-course.—The wound seemed to heal after the last operation, but it remained painful. The swelling was subsiding up to three weeks ago when it started again. The pain started in the left ear and along the center of the cranium and has been very severe. The swelling and pain have been increasing ever since they began three weeks ago. The pain is steady and present all the time.

The inside of the mouth healed smoothly with nothing to indicate a new growth. The whole left side of the face was swollen like an inflammatory

process. The swelling now extended over the temporal region to the orbit, partly closing the eye to well below the jaw. On the cheek a number of small crater-like openings presented which could be made to expel milkish-white flocculi (Fig. 2). The true diagnosis now dawned on me for the first time. The greyish white nodules were crushed and stained and the characteristic filaments of actinomycosis readily demonstrated. The indurated tissues were then injected with Lugol's solution and the patient was given large doses of potassium iodide. Improvement began at once. The process extended toward the ear, however, and he died six months later of meningeal irritation.

Comment.—It seems hardly possible that so clear a history should have been overlooked even in the hurry of practice. The carious bone following the extraction of the teeth should have indicated the truth. When I first saw him the ulcerous lesion surrounded the area occupied by the teeth, the edge was irregular and dense and bled on manipulation. The feel seemed entirely charac-



Fig. 2.—Actinomycosis of the jaw, showing the crater-like openings.

teristic of carcinoma. At none of the subsequent operations was any pus of any sort observed, this in the presence of alleged necrotic bone should have pointed the way, particularly since there was no disposition of the exposed bone to separate itself from the unaffected bone. As Wright long ago pointed out, the literature has too much emphasized the yellow color of the granules. In this case, as in the most of those I have seen, the granules were greyish in color. The failure to appreciate this led me into an error many years ago.

CASE 3.—A girl aged fourteen was brought to me because of a hard growth on the angle of the jaw.

History.—For several years she noticed a small tumor of the jaw on the external surface just above the angle. It caused no pain, but it was beginning to be obvious to the public gaze. It had been diagnosed as sarcoma and its removal by extensive jaw resection advised.

Examination.—On palpation a hard, smooth mass, free from the soft parts but firmly attached to the jaw bone, is evident. The x-ray shows it to be globular and dense throughout (Fig. 3A).

Diagnosis.—Its sharply defined outline and smooth surface shows it to be a simple exostosis, likely a developmental dentigerous rest. Sarcoma can be ruled out because of its smooth surface and constricted base.

Treatment.—An incision long enough to admit a small mastoid chisel was made well under the margin of the jaw. The chisel was introduced and the tumor cracked off at its base. The tumor was then shelled out with the end of a small scissors (Fig. 3B).

Pathology.—The tumor was composed of dense bone throughout.

After-course.—The incision after a few weeks was quite invisible.

Comment.—Bony tumors with constricted bases are presumably benign, and before disfiguring operations are done for their removal, all factors in connection with them should be intelligently reviewed. These dentigerous outgrowths occur most frequently on the oral surface of the jaw.

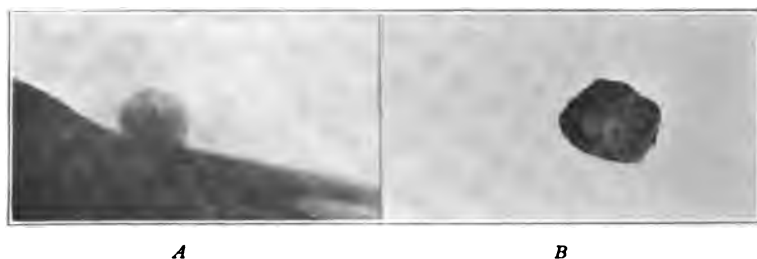


Fig. 3.—Exostosis of the lower jaw. A. As seen by the x-ray. B. As it appeared after removal.

CASE 4.—A student aged thirty sought advice because of a bony prominence on his lower jaw.

History.—For as long as he can remember he has noted a hard prominence projecting from the inner side of the lower jaw toward the tongue. It has not grown and, aside from its presence, causes no disability.

Examination.—A small nodule the size of a hazelnut kernel projects inwards at the level of the second molar tooth (Fig. 4). It is smooth, possesses a covering of mucous membrane, and is extremely dense to the touch. He has the normal number of teeth.

Diagnosis.—Odontoid exostosis. Its long duration and fixicity to the jaw bone distinguishes it from other bony outgrowths.

Treatment.—It was removed with a small chisel.

After-course.—Recovery has been complete.

Comment.—Sometimes simple exostosis occurs about the jaw but these are usually on the outer surface.

CASE 5.—A farmer aged thirty-four came for relief from thickened gums.

History.—For a number of years the patient has noticed that his gums were becoming thicker. At first the disturbance was slight, but for a year or more mastication has been seriously interfered with. His general health is good.

Examination.—Three teeth are absent on the right side and those on the

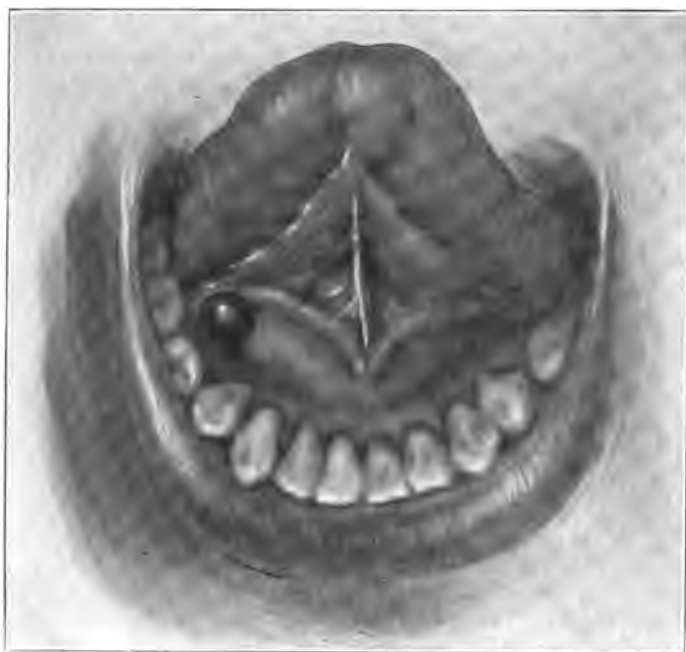


Fig. 4.—Odontoid exostoses of the lower jaw.



Fig. 5.—Hypertrophy of the gums.

left are not normally developed and are irregularly placed. The teeth that are absent he explains were removed because they were decayed before the present trouble began. The gums are so thickened that they protrude nearly to the level of the teeth and extend so far toward the median line that they nearly touch. The thickened mass is dense, elastic, and has the feeling of the softer varieties of keloids. (Fig. 5.)

Diagnosis.—The uniform thickening does not correspond to any definite tumor, and must be called, therefore, a hypertrophy. Epulides are circumscribed and always unilateral. Cysts sometimes affect both sides of the jaw, but they are always uniform and spindleform, never lobulated. These masses are too soft to be derived from the bone.

Treatment.—The hypertrophied masses were removed piecemeal. An area was trimmed down, and after this had healed, another area would be treated in the same way.

Pathology.—The tissue was made up of thick bundles of fibers, about a cross between elephantiasis and keloid.

After-course.—Because of the close histologic resemblance to keloid, I predicted a rapid return, but in this I was happily mistaken for as long as a year and a half after operation no disposition to recurrence was in evidence.

Comment.—The genesis of this affection seems to be a mystery.

CASE 6.—A business woman aged thirty-two consulted me because of swelling of her gums.

History.—For some months the patient has observed a tumor developing back of the incisor teeth. It gradually extended until it covered the greater part of the area of the hard palate. The pain was rather acute in the beginning, but now it is dull with an uncomfortable sense of pressure. The chief cause of complaint is interference with mastication. She has never had trouble with her teeth.

Examination.—The tumor extends from the right lateral incisor to the left bicuspid. It extends backward halfway to the beginning of the soft palate and to below the level of the incisor teeth. It is soft and semi-fluctuating. (Fig. 6.)

Diagnosis.—The tumor has the feel of a lipoma—an indefinite pseudo-fluctuation. Lipomas do not occur in this situation, however. The mass shades gradually into the surrounding tissue which indicates an inflammatory process. If it were located elsewhere one would think at once of tuberculosis. It is at any rate a "cold" abscess.

Treatment.—When cut into a thin pus containing flocculi like tuberculous pus escaped. The bone was exposed for a considerable area, but there seemed to be no bone necrosis.

Pathology.—No culturable organism could be obtained. The slide showed a few cocci and many degenerated polynuclear leucocytes.

After-course.—After some months the abscess was entirely healed and remained so at least for many years and was well when the patient was last heard from.

Comment.—The patient was a well-nourished woman, little suggesting anything of a tuberculous nature. The infection likely was due to an attenuated pyogenic organism. I have repeatedly seen smaller abscesses from near the roots

of decayed teeth. These usually persist until the exact focus is eradicated. None such appeared here and it may be assumed that the infection gained entrance through the soft palate.

CASE 7.—A retired farmer aged seventy-two came to the hospital because of an ulcer in his palate.

History.—The patient had two sisters who died of cancer; one cancer of the larynx, the other cancer of the uterus. A month ago while eating he bit his cheek, causing a sudden sharp pain which did not subside. He consulted a doctor who discovered a white patch on the anterior pillar. This was cauterized. Despite this it continued to spread. His general health has always been good. He uses tobacco in moderation.

Examination.—There is a white patch on the anterior pillar extending to



Fig. 6.—Chronic abscess of the hard palate.

the lower jaw, and over the hard palate. The surface of the area is soft but the border is raised and easily palpable. The border feels as if a tiny string of beads were embedded beneath the surface about the border. The wisdom tooth is still present and injures the affected area between it and the plate of the upper teeth. The border when irritated tends to bleed.

Diagnosis.—Obviously the affection existed before the injury above noted occurred. This event merely caused the patient to seek advice which led to its discovery. The primary state may be accepted without argument as leucoplakia. The question of importance is that of possible malignant degeneration. The raised border and the disposition to bleed makes it probable that a malignant change has occurred. A piece removed for microscopic examination failed

to show definite signs of malignancy though there were some changes in the cell forms and round-celled infiltration (Fig. 7). Cauterization was advised, but refused.

A year and a half later he returned to accept the treatment advised. During the intervening period the lesion extended somewhat, but the chief changes were noted in the border in some areas, particularly over the lower end of the pillar and on the adjoining part of the tongue. Here the border was much raised, was dense and irregular, and bled easily when manipulated with the finger. The membrane was separating at these points and an ulcer was forming.

Treatment.—Excision of the affected area was done. The cheek was split to give access to the affected region. The wound so made was closed by suture.

Pathology.—The border excised showed a distinct tendency to invade the

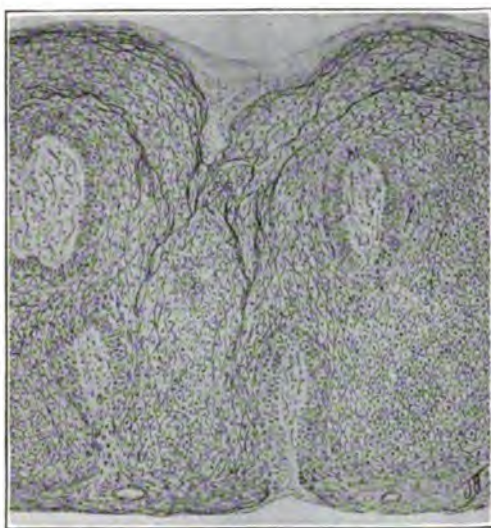


Fig. 7.—Leukoplakia, benign.



Fig. 8.—Leukoplakia undergoing malignancy.

surrounding tissue in some regions (Fig. 8) while in others the microscopic picture resembled that of a year before.

After-course.—Healing was prompt. There was no evidence of recurrence when the patient died of cerebral hemorrhage three years later.

Comment.—When these leucoplastic areas become malignant, they do so slowly and a vigorous cauterization at an early stage may be expected to effectually annihilate them. Had I to meet this indication now I should excise it with an electric knife under local anesthesia. This would lessen the operative risk materially, besides making the incision through the cheek unnecessary. I have employed this means repeatedly without recurrence. It is necessary to reach every nook and corner. Because of the extent of the lesions, this may be a very trying procedure both on the patient and to the operator.

CASE 8.—A traveling salesman aged thirty-eight came to the hospital because of a thickening of his lower jaw.

History.—The patient noticed for several years that the left side of the lower jaw was becoming thickened. It was painless and until it became great

enough to bulge the side of the cheek he neglected it. Now he seeks relief from the deformity.

Examination.—There is a spindleform enlargement on the external surface of the jaw beginning at the mental foramen and terminating at a centimeter or two in front of the angle. At its highest point it attains an elevation of about 2 cm. It is smooth, hard, and painless. The inner surface of the jaw is not affected. The mucous membrane is movable over most of its extent. The bone can not be indented by pressure. There are no teeth missing. (Fig. 9.)

Diagnosis.—The slow growth stamps it as benign. It is evidently connected with the bone. Solid bony tumors are usually globular, the spindleform are usually cystic, combined osseous and cystic are irregular globular. This one must therefore be cystic.

Treatment.—The surface was infiltrated with novocain and the inferior



Fig. 9.—Dentigerous cyst of the lower jaw.

maxillary nerve was blocked at the lingula. The mucous membrane was incised along the most prominent part and the periosteum deflected. The shell was opened with a mastoid chisel. The excess of bony capsule was excised with a small rongeur. That portion of the cyst wall nearest the jaw was curetted. The deflected periosteal mucus flaps were then pressed into the opening and held there by a tampon.

Pathology.—The shell was composed of normal bone, the lining of squamous cells. There were no giant cells.

After-course.—More or less infection took place and some six weeks were required before the lesion was healed.

Comment.—Such simple treatment is always sufficient for this condition. They are often subjected to needlessly radical operations.

CASE 9.—A man aged sixty came to me because of an ulcerated condition in the roof of his mouth.

History.—For six months he has had ulcers in the roof of his mouth, extending more or less over both the hard and soft parts. He states that a Wassermann has been made which was negative, but despite this his physician gave him several doses of salvarsan, but no improvement has resulted. The general history is not illuminating.

Examination.—The patient seems a man in good health. Save for the roof of his mouth he has no lesion of any sort. The site of complaint presents an uneven surface, resembling pictures of fields torn by shells. There seems to be no regularity except about the border, where a reniform outline, both of the individual lesion and their composite arrangement, can be made out. Some areas have healed. Those still in a state of ulceration present sharp, slightly undermined, fairly soft borders. The soft palate, as well as the hard, is affected. Nowhere is there a complete perforation. The pillars and pharyngeal walls are not affected. (Fig. 10.)

Diagnosis.—The outline of the lesions and the type of ulceration is dis-



Fig. 10.—Syphilitic ulceration of the palate.

tinctive of syphilis, and this diagnosis must be maintained despite the serum reaction and therapeutic test. The soft character of the tissue and the tendency to heal, together with the superficial character of the lesion, excludes carcinoma. Tuberculosis is more apt to attack the pillars or pharyngeal wall, but it does not produce the regular outlines found in this case.

Treatment.—The vigorous prosecution of the antisyphilitic treatment was advised.

After-course.—Complete healing took place after several months' treatment with mercury and has remained so.

Comment.—When the clinical character of a lesion speaks pronouncedly for syphilis, the therapeutic test may be pushed to an extreme degree. I have seen lesions respond after 750 grains of potassium iodide were used over a pe-

riod of several weeks after doses of half this amount failed to make an impression after being given for weeks.

CASE 10.—A housewife, aged forty-six, came to the hospital because of a tumor of the upper jaw.

History.—The patient has observed the formation of a tumor on her gums for four years. It has not caused any pain, neither has it bled, but its size begins to annoy her and its esthetic effects were quite unsatisfactory to her. She has had no trouble with any of her teeth.

Examination.—A bluish-red tumor the size of a walnut occupied the external surface of the alveoli corresponding to the incisor and canine teeth. The tumor was smooth and covered everywhere with mucosa. It was constricted at its base and could be moved about somewhat. (Fig. 11.)



Fig. 11.—Epulis of the upper jaw.

Diagnosis.—Its site, consistency, and covering of mucosa identified it as an epulis.

Treatment.—The gingival mucosa was cut through to the bone both externally and internally, well away from the base of the tumor. The alveolar process, together with the incisor teeth, was removed with a large cutting forceps. The exposed bone was cauterized with iodine, and the wound packed to control oozing from the bone. The operation was done under local anesthesia.

Pathology.—The tumor is a giant-celled sarcoma.

After-course.—The wound healed over and has remained a smooth scar.

Comment.—Had the patient been more subservient to suggestion, I should have cut the tumor from the bone with the knife blade cautery, extracted the tooth and then have cauterized the socket. This would have left an alveolar

border which, with a bridge across the toothless space, would have left no deformity.

Epulides with a broad base of attachment along the alveolar process are more malignant and do not lend themselves to such conservative treatment. Fortunately they are usually situated farther back, and the removal of the alveolar process does not cause so much deformity.

CASE 11.—A boy aged eight was brought to me because of a tumor of the gums.

History.—Nine months ago it was noticed that the lad was developing a tumor of the gums of the upper jaw. Three months ago it was removed by the family doctor. It returned promptly, and now is larger than before the operation.

Examination.—Going out from the region of the canine tooth of the right upper maxilla is a tumor the size of a hickory nut (Fig. 12*A*). It is irregularly lobulated and surrounds the canine and bicuspid teeth. It is dense to the touch and covered with mucosa except in two places where a red fibrous mass seems to be forcing itself through the covering. The base of the tumor is sharply defined from the gums.



Fig. 12.—*A*. Epulis of the upper jaw after removal. *B*. Epulis of the upper jaw before removal.

Diagnosis.—Its density and the fact that the covering epithelium is unaffected indicates that it is an epulis. It is too firm for a granuloma and too large. It is too sharply defined to suggest a periosteal sarcoma.

Treatment.—The alveolar border, together with the teeth, were removed (Fig. 12*B*).

Pathology.—The tumor is made up of fibrous tissue without giant cells.

After-course.—The patient remained well.

Comment.—Epulides are ordinarily semibenign tumors, but frequently, when incompletely removed, they show great malignancy, particularly those without giant cells. Usually the teeth affected must be removed to the base of their sockets. However, the small ones arising from the surface of the gums may be destroyed with a cautery and the teeth saved.

CASE 12.—A farmer aged thirty-nine came to the hospital because of a tumor of the left upper jaw.

History.—The patient first noticed a slight swelling of the gums outside of the left eye tooth three years ago. It remained stationary about a year, and then started to grow. At the end of the first year his dentist curetted the enlargement from the gum and from around the tooth roots. It remained away for six months then started to grow again and was curetted once more and burned with acid three times. In the last three months it has grown rapidly and the enlargement could then be noticed from the outside. It never gave any pain until the last few months, when a disagreeable sensation was noticed over the cheek bone. It has never bled.

Examination.—A tumor is seen extending from the alveolar process in the region of the bicuspid and molar teeth on the left side (Fig. 13). The surface is smooth and is entirely covered by epithelium. Bosselated borders widen the alveolar border half a centimeter on either side. It does not seem to extend into the antrum. There is no other evidence of involvement.



Fig. 13.—Epulis of the upper jaw.

Diagnosis.—The growth is obviously an epulis. It seems confined to the immediate environs. The patient is very desirous that removal be effected without making an incision through the cheek. The growth is so well confined that local resection seems warranted.

Treatment.—The growth was removed under local anesthesia, with a considerable free margin through the mouth. The antrum was opened into for an inch or more.

Pathology.—The slide shows the usual giant celled sarcoma.

After-course.—The wound healed, but in less than a year extensive involvement of the upper jaw had taken place. A complete resection of the upper jaw was then done but without avail. The growth returned and caused his death a year later.

Comment.—When a surgeon approaches a malignant growth he should be deaf to sentiment. A resection of the entire superior maxilla in the first place I

have no doubt would have resulted in a cure. Once an epulis has recurred, further temporizing is not permissible. This is one tumor that is curable, and if its cure is not accomplished the plans must have gone awry somewhere.

CASE 13.—A school teacher aged forty-two came because of a tumor of the gums.

History.—For three months she has noticed a small tumor growing between two of her front teeth. It has not been painful, but sometimes it bleeds. Her doctor removed a part of it and sent it to a professor of pathology in a neighboring state who returned a report of a small round-celled sarcoma. On the basis of this she comes to have a resection of the jaw. Her health is good.

Examination.—Between the canine and bicuspid teeth is a deep red fungus-like tumor the size of two grains of corn. It is soft and compressible,



Fig. 14.—Granuloma of the alveolar border.

but quickly regains its form. Its base occupies the space between the teeth and about their roots. Bleeding follows the attempt to determine the extent of its attachment. (Fig. 14.)

Diagnosis.—It is too soft and bleeds too readily to be an epulis. Furthermore, epulides do not develop so rapidly. Its rapid growth, its vascularity and its tendency to bleed stamp it as a granuloma. Sarcoma it most certainly is not. Small round-celled sarcomas of the jaw are very rare and they involve a greater space.

Treatment.—The growth was cut off with a cautery knife blade and the site of origin carefully cauterized. The teeth were not pulled.

Pathology.—The tumor is made up of small round cells with round nuclei

and sparse protoplasm, together with many polynuclear lymphocytes. The whole is interspersed with bundles of fibrous tissue. The connective tissue was small **in** amount and interspersed between the cells.

After-course.—Healing was prompt and permanent.

Comment.—The error here was possible because the pathologist attempted to make a diagnosis on the microscopic picture alone. Not infrequently granulation tissue simulates sarcoma and a consideration of the clinical history must be taken into account.

DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Under the Editorial Supervision of

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It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

CONGENITAL ABSENCE OF THE PERMANENT TOOTH BUDS

BY DR. SAMUEL HEMLEY, BROOKLYN, N. Y.

Clinical Assistant, Department of Oral Surgery, Vanderbilt Clinic, New York.

A PATIENT, a young girl, age ten, was recently referred to me for radiographic examination. Upon examination of the patient's mouth, I found that she had two permanent upper central incisors and her four six year molars,

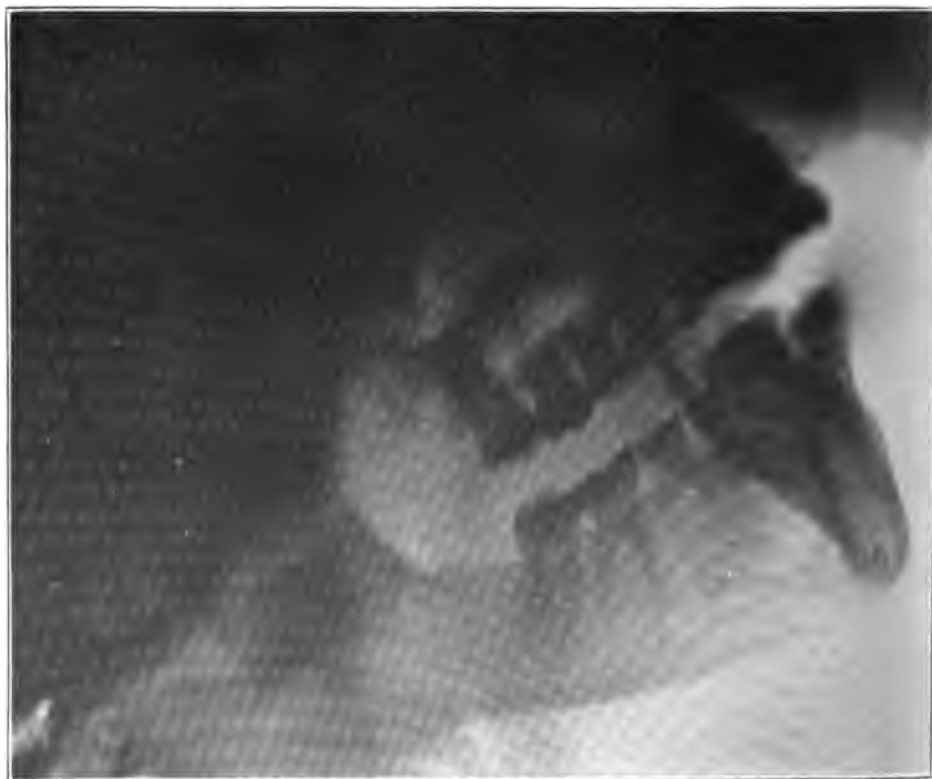


Fig. 1.—Right lateral view.

and all of her remaining teeth were of the deciduous set. I took a plate picture of each side of her head (Figs. 1 and 2), and found the buds of but two succedaneous teeth present, the lower left first premolar, and the upper left cuspid.

At a recent meeting of the American Society of Orthodontists at St. Louis, Dr. J. Lowe Young of New York spoke of a case having seventeen permanent teeth missing. Up to that time, the greatest number ever reported missing was fourteen. Dr. Ottolengui, in the *Items of Interest* of Feb. 19, 1913, reported the case of a woman of thirty-five with the following teeth absent, "in the upper jaw, two lateral incisors, the first, second and third molars on the left side, and the

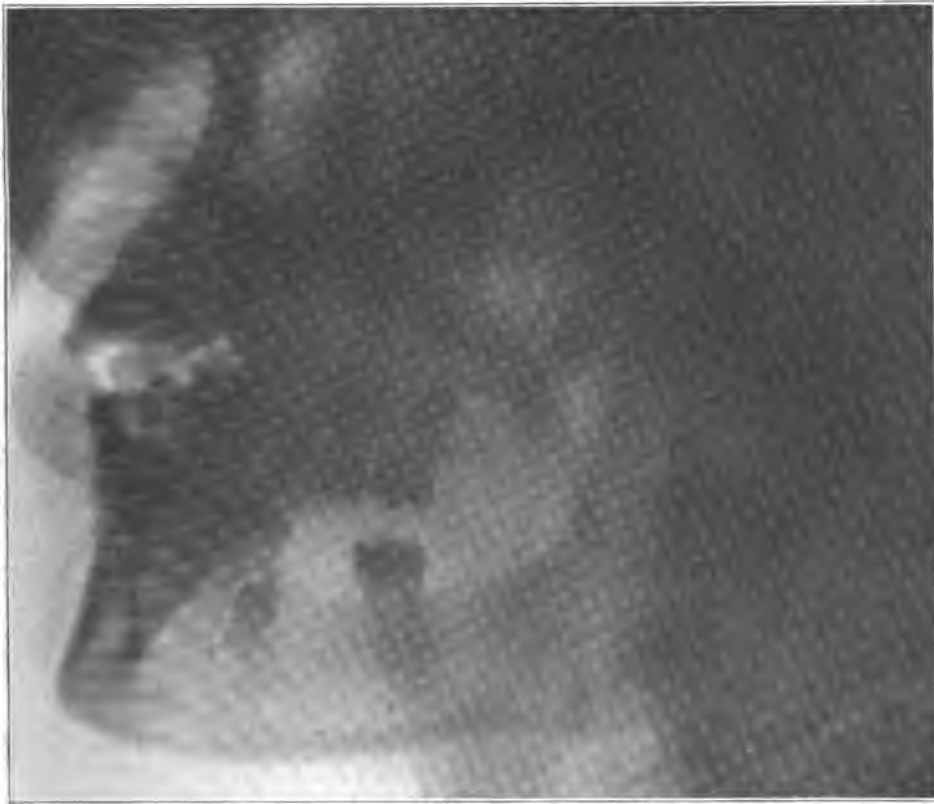


Fig. 2.—Left lateral showing the bud of the lower left first premolar.

second and third molars on the right side. In the lower jaw the missing teeth are the second bicuspid and all three molars on the right side, and both bicuspids and third molar on the left side.

In the case of the patient on whom I am reporting there are twenty-four of the permanent teeth missing; as follows: In the upper jaw, on the right side, the lateral incisor, cuspid, the two premolars, and the second and third molars; on the left side, the same teeth with the exception of the cuspid. In the lower jaw, on the right side, the central and lateral incisors, cuspid, the two premolars, and the second and third molars; on the left side, the central and lateral incisors, cuspid, the second premolar, and the second and third molars. In short, the only

permanent teeth are the two upper central incisors, the four six year molars, and the buds of the upper left cuspid and the lower left first premolar.

It is quite difficult in cases of this sort to ascertain the authenticity of the case, because the patient may not recall having had some of the teeth extracted when a child. However, in this case all of the deciduous teeth having no successors are present, with the exception of the lower left second molar (Figs. 3 and 4), which was extracted about three months ago because of extensive caries.



Fig. 3.

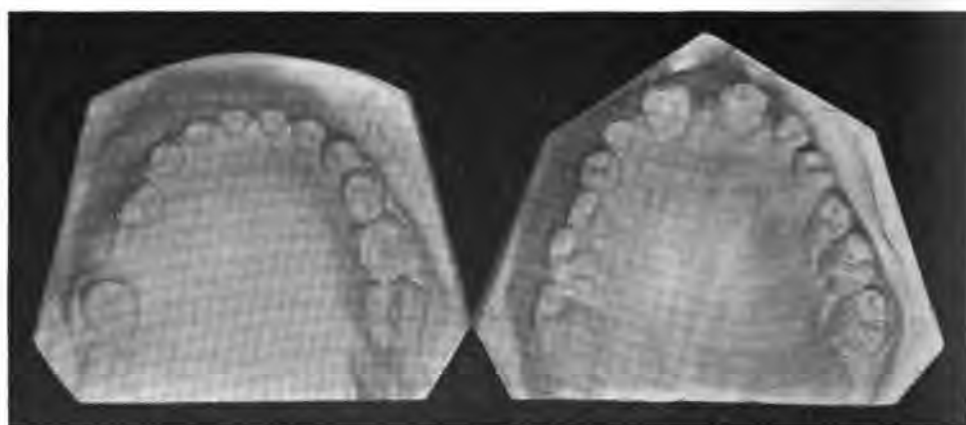


Fig. 4.

We are thus able to account for every tooth, eliminating the possibility that she may have lost some of the teeth by extraction.

The patient gives a history of having had rickets in infancy, and chorea from her third to her fifth year. She is anemic, marasmic, and of a very nervous temperament, and it was with extreme difficulty that the accompanying radiographs and impressions could be taken. The small films (Figs. 5, 6, and 7) show the upper and lower anterior teeth and the bud of the upper left cuspid somewhat more clearly than they can be seen on the larger plates.

Her younger sister, age two and one half years, has a marked distoclusion with a micromandibular development. Neither parent shows any condition which may tend to show that the condition is one of heredity.



Fig. 5.—Lower anterior teeth.



Fig. 6.—Upper left showing the bud of the cuspid.



Fig. 7.—Upper anterior teeth.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Beginnings in Orthodontics. H. Chapman. *The British Dental Journal*, 1920, xli, No. 3, p. 111

The best age for the beginning of orthodontic treatment is, on an average, six years. The author emphatically states that fourteen and even twelve years of age is too late for treatment to accomplish the best results. The following reasons are given, those of lesser importance coming first, for treating orthodontic cases at six years of age: (1) It is an active period of growth. (2) Treatment probably stimulates developmental activity. (3) An enlarged oral space probably means an enlarged nasal space, and so a reduced liability to nasal stenosis and mouth breathing. (4) Early correction may prevent facial deformity. (5) If appearance of appliances is unsightly, it is of no consequence. (6) Teeth erupting into a rotated position may be guided into a normal position. (7) Places are made for erupting teeth instead of those erupting and having to be moved into correct positions later. (8) Little physical force is needed. (9) Temporary teeth are used for anchorage. Any damage to these is of less consequence than if it happened to the permanent teeth; the same applies to the other deciduous teeth and soft tissues around them. (10) Retention is simplified.

Normal occlusion should always be assumed to be the correct result to aim at, but it is open to variation under certain conditions, such as absence of permanent teeth (apart from unerupted teeth) or a state of the teeth demanding extraction as their only treatment. If a variation from the normal result is decided on, the dentist must be sure that the treatment will be simplified thereby and that the resulting occlusion will be good. In many instances the treatment of orthodontic cases is not so difficult a matter as is often believed, if they are dealt with along the lines of preventive rather than curative treatment. Experience with this work should be obtained by undertaking simple cases before treating difficult ones.

Epithelioma of the Mouth in a Young Person. P. Napier Grant. *British Medical Journal*, Dec. 13, 1919, ii, p. 775.

The patient was a boy not quite eighteen years of age, who in his work as an upholsterer had been in the habit of nipping threads with his teeth and filling

his mouth with tacks. A swelling formed in the left cheek and the regional teeth became loosened, so that the patient was enabled to extract the left upper second bicuspid tooth and soon afterwards the two molars on the same side. A growth of typical epitheliomatous character was found to involve the left half of the palate with an extension to the right of the middle line. The alveolar margin from the upper second bicuspid on the left side backwards was broken down; and a probe passed into the maxillary antrum, gave the sensation of having entered a rather soft mass which bled freely. The Wassermann reaction was negative. Two pieces of the growth were removed for microscopic examination, and the specimen was found to consist of two portions of rather firm pinkish-white tissue; both consisted almost entirely of squamous epithelioma of somewhat active-looking type, many of the cell processes being very fine and free from horny change, while others showed typical concentric cell nests. The treatment was surgical, in the form of excision of the left upper jaw; the diseased structures were removed as thoroughly as possible up to, and including, part of the floor of the orbit. The anterior ethmoidal cells, being involved, were cleared out. Subsequently radium was repeatedly applied in the nostril and externally below the left orbit. The patient made a good recovery from the operation, and for some months his condition was improved, but symptoms developed gradually which indicated extension of the disease to the cerebral centers, and he died less than a year later. The age at which the growth presented itself and the comparatively small amount of suffering are noteworthy features of this case.

The Value of Radium in the Treatment of Neoplasms of the Nose, Throat, and Mouth. G. B. New. Radium, 1919, xiv, No. 1, p. 12.

During the last two years at the Mayo Clinic, 211 neoplasms of the nose, throat, and mouth have been treated with radium, including 55 intra-oral tumors of the jaws and cheeks, mostly epitheliomata; 7 tumors of the palate; 24 tumors of the tongue; 27 tumors of the upper lip; and 2 tumors (angiomas) of the lower lip. In the treatment of malignancy of the jaw and cheek the growth, if surgical, is first thoroughly cauterized by slow heat cautery by means of a soldering iron. In about two weeks, radium is applied directly into the raw area. The radium is applied again in from three to four weeks and as often as necessary later. The addition of radium to the treatment has made the immediate results at the clinic much better than they have ever been before. Twenty-one cases of cancer of the jaws and cheeks were treated during the year 1917; twenty of the number have been traced; fourteen of these have had no local recurrence. In two of the fourteen cases glands of the neck have developed and block dissections have been done. In one case of primary squamous cell epithelioma of the cheek almost perforating, the tumor cleared up entirely and there has been no recurrence for more than a year. The author emphasizes that this is an unusual but nevertheless encouraging result, which calls for the use of radium in many inoperable cases. Leukoplakia of the mucous membranes of the mouth is treated with radium and the condition cleared up.

Although the immediate results of the treatment of the neoplasms of the nose, throat, and mouth with radium are as a whole very encouraging, the treatment by radium of any neoplasm that is surgical is not to be recommended. In

such cases the patient should have the benefit of both surgery and radium. The use of radium has changed entirely the prognosis in neoplasms of the nose, throat, and mouth.

The Bacteriology of Pyorrhea. L. G. Turner and A. H. Drew. *British Medical Journal*, 1919, i, p. 675.

The results of an experimental inquiry into the bacteriology of pyorrhea served to establish the immense importance of the mouth as a potential source of disease. The living pulp appears to become readily infected, such infection being not necessarily associated with caries in the ordinary acception of that term. Mixed infections are always associated with caries to a greater or less extent, and in at least one instance the vessels of the pulp were found to contain organisms (diphtheroids and cocci). It is certain that the dentinal tubules are frequently infected from the pulp cavity. While probably any organisms in the mouth can infect pulp, those most usually associated with dentinal infections seem to be comparatively few in number, namely, diphtheroids, cocci and spirochetes. Infection of the cementum is frequent, and three routes can be distinguished—(a) from the pulp cavity and tubules; (d) through the periodontal membrane; and (c) from surface caries. There is evidence that cementum can be infected from a living but infected periodontal membrane. A layer of bacteria is always found on the denuded roots in pyorrheal pockets, and explains the difficulty of treating pyorrhea without thoroughly cleaning all such denuded roots. In chronic cases bacteria are invariably present in the gums; the most frequent are diphtheroids, streptococci and staphylococci. In one instance a heavy infection with a sporing bacillus was observed; the gum showed chronic fibrous thickening; there was no pocketing by destruction of the alveolar dental membrane, neither was there any ulceration; apparently the bacteria gained entrance through a severely inflamed surface. A section from the gum flap overlying an erupting wisdom tooth in a man of 48 years showed dental sepsis at its earliest moment; namely, just as the gum uncovered the tooth and left the crypts open to infection. Here a pure diphtheroid infection was to be seen running up the lymphatics. Sections of granulomata from the apices of teeth invariably showed the presence of microorganisms. Sections through the jaws with teeth *in situ* from cases of advanced pyorrhea showed heavy infections of the bone, a striking fact being the presence of organisms within the Haversian systems. It is noteworthy that in all chronic cases, any indication of phagocytosis was found to be absent.

Diagnosis of Paradental Cysts of the Superior Maxilla. P. Jacques. *La Presse Medicale*, November 19th, 1919, p. 696.

The term "paradental cysts" is applied to certain unilocular fluid tumors with serous contents, developing in the substance of the upper jaw, reaching to the root of a carious tooth, and enclosing no structural element of a crown. The author was never enabled to observe these growths in the mandible and attaches diagnostic importance to this exclusive localization in the superior maxilla. Paradental cysts may be either closed or open. The former on reaching the surgical

stage of their development, cause a deformity of the jaw in the form of a swelling of one of its walls, more or less accessible to exploration. Paradental cysts situated in the external gums result in a very striking bulge of the cheek or lip, but the use of the speculum is usually required to show the elevation of the nasal floor, frequently present in cysts derived from the incisors. Palpation yields very variable findings; the most prominent portion of the tumor may be hard and smooth like a ball of ivory or it may be as easily indented by the examining finger as a simple subperiosteal abscess. The affection most closely resembling closed paradental cyst, in its external symptoms as well as in its mode of development, deforming without perforating the outer table of the maxilla in its different portions, is mucocele of the antrum of Highmore. Information is furnished by rhinoscopy and especially by the findings on exploratory puncture. Intra-buccal transillumination shows the cyst with its serous and transparent contents, as a light spot whereas a cheek which covers a mucocele filled with a deeply colored viscid mass is marked by a dark spot. Aspiration fails to obtain material from the thickened contents of the mucocele, but it is easy to fill the syringe with a few cubic centimeters of the amber-colored serous contents of a paradental cyst. Sarcoma leads to deformities comparable to those of fluid tumors, and has a certain predilection for the region of the ascending ramus, so that it might be mistaken for a cyst derived from the lateral incisor or the eye tooth. A distinction between malignant tumors and benign growths of cystic character can usually be made on the basis of the normal condition of all corresponding teeth (paradental cysts develop only on carious teeth), adhesion and early vascularization of the tissues, a different consistence, the findings on diaphanoscopy and radioscopy. The same remarks apply to the differentiation of paradental cyst from primary epithelial cancer of the antrum of Highmore. Osteoma of the maxillary sinus is extremely hard on palpation and opaque to radioscopy. More serious diagnostic difficulties are apt to arise in the differentiation of paradental cysts from inflammatory swellings of the jaw. Open paradental cysts constitute fistulas rather than tumors of the maxilla. In these cases the wall of the cyst has been broken down by incidental or purposeful extraction of the causative root, suppurative infection of the gums, or other causes, giving access to the pyogenic mouth germs and leading to the establishment of a permanent or intermittent fistula, with a purulent or serous discharge. The fistula is always situated in the mouth, as a rule on the floor of an alveolus, frequently also on the external gums, much more rarely on the palate. Paradental cyst with fistula-formation is apt to be confused both with sinusitis and with ordinary chronic dental abscess.

Adamantinoma of the Superior Maxilla. F. Weichselbaumer. Wiener Klinische Wochenschrift, 1919, xxxii, No. 35, p. 881.

Among the tumors of the jaws, the adamantinomata (which bear this name on account of their origin from a special embryonic tissue) rank practically first in regard to rarity of occurrence. A case of this kind was recently operated upon in the surgical department of the Linz General Hospital, the patient making good recovery. Nineteen years ago, as a boy of ten years, he had been operated upon on account of a tumor in the right upper jaw, this tumor was said to have de-

veloped as a sequela of a tooth extraction and was situated in the region of the molar teeth, involving, not only the bone, but also the gingiva. It was interpreted as a fibroma and was removed as radically as possible through partial resection of the right maxilla. About seventeen years later, the patient again noticed the formation of a solid, hard tumor in the same upper jaw. This new growth bulged out in the region below the infraorbital margin and presented a nodular surface. The only remaining teeth in this half of the maxilla were the canine tooth and the two incisors. The tumor was removed, and on the basis of the microscopic findings it was interpreted as an adamantinoma presenting in some localities the histologic features of a cylindroma. Malignancy in the sense of a destructive growth was not demonstrable in this fibroepithelial tumor. The seat of predilection of these tumors is the mandible, their occurrence in the upper jaw being very uncommon. The region of the wisdom tooth is especially susceptible. The greater tendency to recurrence, noted in tumors of the upper jaw, is probably due to the fact that the maxilla can not very well be operated upon as radically as the mandible. The diagnosis usually meets with difficulties. Such new formations have often been regarded as fibromata or osteomata and even as infectious granulomata, especially in those cases in which the buccal mucosa was also involved and altered through secondary infection. According to the literature, the accurate diagnosis was permitted only by microscopic examination in the majority of the cases. The nodular appearance in x-ray pictures may possibly be utilized in the rendering of the diagnosis.

Adamantinomata of the upper jaw are especially rare. The author's case (which undoubtedly must be interpreted as a recurrence) probably representing the fifth known instance of maxillary as distinguished from mandibular adamantinoma. Of the latter, the literature contains about fifty cases. The tumors may develop at any time, from infancy to the fifth year. In view of the fact that they grow very slowly at first, causing practically no disturbances, their beginnings can probably be referred to the time of puberty or perhaps still earlier to the period of dentition.

Dental Sepsis in Children. Its Consequences and Treatment. F. St. J. Steadman. *The Lancet*, London, 1920, 1, p. 303.

The author discusses the effects of marked dental sepsis on the health of children, and the treatment of this sepsis from a broad national point of view. The former are considered under two main headings (a) general, and (b) local. Dental sepsis may have a profound effect upon the general health of the patients. A common result of oral sepsis in children is gastrointestinal derangement, as evidenced by gastric and abdominal pain, fetid diarrhea with much undigested food in the stools, marked wasting, fretfulness, night-terrors, loss of appetite, sleeplessness, and pallor of the face. Such patients frequently recover very soon after extraction of the septic teeth. Diseases such as septicemia and endocarditis may be caused through absorption into the blood stream of septic matter from the mouth. Local sequelæ of dental sepsis may occur through spreading of the infection to the adjacent parts by continuity of tissue; resulting in pharyngitis, tonsillitis, otitis media, and exceptionally in meningitis. Infection may pass down the lymphatics to the submaxillary and cervical glands. The enlarged

glands often rapidly diminish in size after the removal of septic teeth, but they do not always quite disappear. It has been shown that sepsis in the deciduous teeth not uncommonly leads to damage of the permanent teeth beneath them. The carious tender teeth by disuse bring about a gingivitis which may spread to the periodontal membrane of the permanent teeth, with all its consequent ill effect upon the health of the individual. The author points out that the above is a by no means complete picture of the possible consequences of dental sepsis in children and upon the national physique. Radical treatment is accordingly an urgent necessity, and the author extracts all deciduous teeth in which the decay is sufficiently advanced to infect the pulp. As a general rule, the antagonists of the carious teeth are also removed, because a functionless tooth, owing to the tenderness of the gum around it, due to the frequent lodgment of food-remnants is liable to prevent mastication and to reduce the pernicious habit of unilateral chewing. A marked gingivitis will develop on the unusual side, and with the establishment of the habit, the permanent teeth after this eruption will quickly become septic also. The author is convinced that many cases of periodontal disease can be traced back to tender teeth in the child. It takes a considerable amount of courage to condemn a large number of teeth in a child. This necessary courage can only be acquired by observing, recording and pondering over the evil consequences of having these septic teeth. If extensive extraction has been decided upon it is very important that the removal of the teeth should be carried out at one time under one general anesthetic, such as ethyl chloride, in order to put less strain upon the nerves of the little patient. The author can see no great objection and very little risk in extracting at one operation all the teeth requiring removal.

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EDITORIALS

The Dental Hygienist

IN the International Journal of Orthodontia, September, 1917, iii, No. 9, appeared an editorial questioning the value of dental hygienists and the possibility of instructing them according to the curriculum as outlined in one of the schools established for them about that time. All the arguments advanced then regarding the undesirability of dental hygienists still hold good, and some of the conditions which have developed within the last three years have convinced us that the possible difficulties outlined in the editorial are occurring and will continue to occur as the dental hygienist becomes more popular and more common, a condition which evidently will result on account of their being licensed by certain states.

We are now convinced more than ever that the dental hygienist is a professional mistake. She will do the dental profession no good, neither will she benefit the public to the extent believed by the men who advocate the changing of our dental laws so that the dental hygienist may become an auxiliary to the

dental profession. We say "auxiliary to the dental profession" with a certain amount of forethought, because we have been unable exactly to classify dental hygienists or to ascertain where they will be placed. The choosing of the name was more or less unfortunate, as was shown by the *British Dental Journal* in 1917, and which was referred to in our editorial in September, 1917. For example, a hygienist as described and licensed according to the dental laws in some states is entirely different from a hygienist as found in the medical profession and as understood by the laity. A hygienist in the medical profession is a man who has a medical degree and who has taken extra training and has received the degree of Doctor of Public Health or some similar designation showing that he has as much knowledge as the average physician and has specialized along the lines of public sanitation. The dental hygienist is unlike this sort of physician; in fact, there has never existed a similar class of individuals: she is neither a dentist nor a nurse, and above all things she is certainly not a hygienist. It is our opinion that in the majority of states which have passed laws recognizing dental hygienists, the dental profession has tried to keep them under its supervision and has passed laws specifying that they shall only work under the supervision of a dental practitioner. This in itself shows that the men who favored the dental hygienists do not exactly know where to place them, or perhaps are afraid of them. The dentists are willing to allow the dental hygienists to do something, but in return they (the dentists) say, "you can not do this thing that you are licensed to do, unless you do it under supervision of some one else." If the dental hygienist is qualified to polish and clean teeth above the gingival margin at all, she is certainly qualified to do this without the supervision of a dentist. Thus it would seem that men who favor the dental hygienist propaganda want to start something which will be for their own benefit and glorification and then keep it under their control.

We have mentioned the fact that the dental hygienist is neither a nurse, a dental assistant, nor a dentist. This has been proved in two instances. About a year ago a bill for the licensing of dental hygienists was sponsored by a number of men in California, among whom Dr. Guy B. Millberry was one of the chief advocates, and he tried to get a bill through the legislature, licensing dental nurses. Some one objected to the name "dental hygienist" and therefore California decided to call them "dental nurses." As a result of this bill making its appearance before the legislature, all the nurses' associations in California immediately began an active propaganda against the bill, asking that the name of "dental nurse" be changed, because they contended the so-called "dental nurse" was not an *ipso facto* nurse, and consequently was not justified in using the term. In order to overcome the activity of the nurses' associations in California, the sponsors and advocates of the bill changed the name to "dental hygienists" as a compromise to avoid the opposition of the nurses' associations. This, therefore, proves that in that instance the medical nurses did not consider the dental hygienists in their class; and we agree with them, because a medical nurse takes a thorough training extending over a period of three or four years, while a dental hygienist takes a few months' training along a limited field, and consequently is really not qualified to use the word "nurse." In an article published in December, 1919, *Dental Cosmos*, Dr. Thomas J. Barrett also calls attention to the fact that

the medical nurses through "their organization was represented at the hearings on the bills in Massachusetts and filed a strong protest before the Committee on Public Health in Massachusetts against the word 'nurse' as applied to this new species." Thus we have two examples, the one in Massachusetts and the other in California, which shows the dental hygienist is not a nurse, and is not recognized by the medical nurses as being upon an equal plane with them. However, in spite of this lack of recognition by the medical nurses, we find a number of men who would have us believe that the dental hygienist is the salvation of the human race, and unless they are licensed in all states, the public will suffer, and the health of the individual will be greatly neglected.

At the present time, in considering the dental hygienist, like other undesirable things in our midst, it is well to pause a few moments and consider why they are here, or what wonderful advantages are supposed to be gained by the licensing of dental hygienists in all states. The dental hygienist seems to be the outgrowth of propaganda relative to oral hygiene, which had its appearance several years ago in certain communities, and we remember that oral hygiene was also fostered as being the salvation of the human race and the dental profession. Later came certain infirmaries, large organizations taking care of the poor; and as a result of their activities, courses for dental hygienists were established. Consequently, after these courses were established, it became necessary that these institutions have some place where their graduates could go and practice their calling as a legalized activity. Men interested in these institutions became active in having laws passed in various states licensing the dental hygienist. It is well to inquire as to one of the probable reasons why these infirmaries were anxious to establish courses for dental hygienists. It necessarily follows in institutions of that kind that a certain number of assistants will have to be obtained to conduct the business, and it would be a much cheaper proposition to arrange a course of training for dental hygienists and have these women polish and clean the teeth of children, than it would be to employ dentists to do such work. This demonstrates why such institutions are anxious to have dental hygienists recognized. Along the same lines, we also realize why Dr. Millberry, of the University of California, was anxious to have dental hygienists licensed in California. It would enable him to select a number of women to serve as dental assistants in the clinic at the University of California; instead of paying them a salary, which regular nurses would demand, they would pay him a fee and he would be working for the advancement of the University—for the so-called advancement of the dental profession—and at the same time would provide the University dental clinic with a number of assistants that would make a very good appearance before the public. After these girls had taken their course, it would be necessary for the state board of California to license them to enable them to practice their calling.

In considering this question, we have also arrived at "why" the dental hygienist made her appearance along with the oral hygiene propaganda, and to a certain extent became a necessary adjunct in the large dental infirmary; which led those men interested in dental infirmaries to insist that she become licensed in order that they might make their courses more attractive to young women.

However, we find the dental hygienist has not only been advocated by men

who may have a direct personal interest in the affair, but by a number of other individuals who seem to believe the dental hygienist would be a wonderful thing for the general public and play a great part in public schools, and serve a useful end towards teaching oral hygiene to the public. To advance this cause, we find arguments made as to the large amount of decay in the mouths of children, to the great need for dental training in the public schools, and the education of the public. We are led to believe the dental hygienist is the only individual who can properly educate the public; when as a matter of fact, we must pause and ask, "Who is going to educate the dental hygienist?" If the dental profession is able to educate the dental hygienist, the same dental profession should be able to educate the public. Why make the education of the public such a second-hand matter? The dental hygienist is not needed to educate the public; the dental profession is perfectly able to spread such knowledge as the public may need. The answer to this argument from the dental hygienist standpoint is immediately that we have not enough dentists to take care of the need of the public, consequently the dental hygienist must be employed to fulfill that need. This to us sounds like a very weak argument, because if the public is in need of dental service and dental education, the thing to do is to provide the public with more dentists to perform that service, and not with a class of individuals who have an inferior amount of education and training.

Those who favor the recognition of the dental hygienist contend that public necessity and public welfare demand that we have dental hygienists in the public schools, hospitals, and almost every other place that they can imagine. "Provided we have them," we are inclined to ask, "what good will they do?" If the public needs dental service, a dental hygienist is certainly not the person to render that service, because all state laws limit their activity to the polishing and cleansing of the crown portion of the tooth.

We suppose this treatment is based upon the old idea that a clean tooth never decays, which is a very safe statement to make, because no one ever saw a clean tooth. We also wonder whether every one who advocates the dental hygienist is familiar with the real dental need among children, and what is really going to constitute the salvation of the teeth. In conversation with Dr. F. P. Hyatt, who is one of the most active advocates of oral hygiene, we find that as a result of an examination of a number of school children, he makes a statement that something like 53 per cent of the cavities found in first molars appear in the occlusal surface. The other 47 per cent were divided among the four surfaces of the tooth. Now the 53 per cent of cavities occurring in the occlusal surface of the first molars will never be prevented by dental hygienists or prophylactic treatment such as polishing and cleansing the teeth; it occurs as the result of anatomic defects in the enamel of the teeth. The next two most susceptible surfaces, as we remember his statement, were the buccal surface of the tooth and the mesial surface. The buccal surface decays because of an imperfect development in the buccal groove, and the mesial surface decays because of a cavity in the distal side of the deciduous molar resulting from improper attention to the decay of the deciduous molar. Consequently, the decay in the first permanent molars, which occurs on the three most vulnerable surfaces—the occlusal surface, the buccal surface, and the mesial surface, can only be prevented by dental treat-

ment such as a proper filling of the deciduous molar and prophylactic filling placed in the occlusal surface of the first molar. The dental hygienist is not supposed to put in fillings in the deciduous teeth, or prophylactic fillings in permanent molars, consequently the greatest thing that will prevent decay of the permanent teeth in children, the dental hygienist is not permitted to do. Thus a great usefulness disappears, because any one with common sense knows that polishing the occlusal surface of the first molar in which there are anatomic defects is not going to prevent its decay.

The other argument advanced by advocates of the dental hygienist is that the public needs dental attention. We shall answer by saying: if the public and public schools need dental attention, they should be given good dental service and not something that is limited. If the poor who can not employ the services of a competent dentist are to be taken care of by the public, they certainly are entitled to the best that can be obtained, and the dental hygienist is not the best. If the public is to be given anything and rendered any service, give them the best that can be obtained, give them a dentist in the public schools or in the clinic who is able to perform all services that may be needed, do all the work necessary, and thus let the people know what real dental care of the teeth amounts to.

We are aware of the fact that the statement is made that there are not enough dentists to take care of the public, and in answer to that, we can only say that conditions must be so changed as to provide enough dentists. If with the four year course and the increased educational requirement enough dentists cannot be produced, the only thing that remains then, is to put the educational requirement to the point where enough dentists will be produced, or for those men who advocate the necessity of a public dental clinic, to make the public dental clinics attractive enough from the standpoint of remuneration, that men will study dentistry and avail themselves of the positions offered, as medical men now study hygiene and avail themselves of the position in the public health department.

Dr. Barrett in his article in December, 1919, *Dental Cosmos*, made the statement that to his knowledge the majority of men who advocated the dental hygienist were doing so because they claimed the public demanded them and because they were demanded in public clinics. He stated that to his knowledge the majority of dental hygienists who had graduated from various infirmaries had been taken up by men in private practice, and therefore the public was not receiving the so-called benefit that it was supposed to receive from dental hygienists.

In the March, 1920, issue of the *Dental Cosmos*, is a communication from Dr. Harry M. Beck, and he quotes a letter from Dr. Burkhart in which Dr. Burkhart states "that over 45 per cent of the graduates of this school are or have been employed in schools, hospitals, and public institutions." Admitting that 45 per cent of the graduates from the Eastman Infirmary, or "55 per cent at certain times," as Dr. Burkhart states, had been employed in schools, hospitals and public institutions, and that Dr. Barrett is incorrect in stating that the majority of them have gone into private practice, we still contend that if they have not gone into private practice it is all the more unfortunate. If they have gone into schools, hospitals, and public institutions, the public is having forced upon it a

service which it is unable to avoid. The dental hygienist is necessarily going to render an inefficient and unsatisfactory service from the dental standpoint, because her work is limited. The general public is led to believe that the polishing of the crown portion of the tooth is the acme of dental service, when, as a matter of fact, we know it is not.

The dental hygienist in private practice is going to do much less harm than she will in hospitals and schools, because the mass of the public who are willing enough to pay for dental hygienic services in the private office have no one to blame but themselves for their being humbugged by getting inferior dental service. People who are forced to take the dental hygienist are to be pitied, because they can not help themselves; they have to take what they are given.

We find that Dr. Beck in his article in the March issue of the *Dental Cosmos* seems to have a particular grievance with Dr. Friesell and asks what Dr. Friesell is going to do to meet this problem. We suppose Dr. Beck refers to the necessity of dental education rendering service to the public, and if this is the question to which he refers, we can only say that Dr. Friesell is doing the only logical thing to meet this question by educating dentists who are qualified to render the public a dental service. We say again, that if the general public is in such need of dental service and assistance, give them dentists and not dental hygienists. Also Dr. Beck, like the usual hygienist advocate, seems to think that dental hygienists are the only solution of the problem, and that "the medical men are holding out their hands to us for help; the opportunity is here to move onward and upward." If the medical profession is looking for help from the dental profession, our sincere hope is that the dental profession will not pawn off on the medical men the dental hygienist as the solution to dental needs and dental requirements. If we are going to "move onward and upward" as Dr. Beck advocates, let us move onward and upward by rendering as great a dental service to the public and by enabling the public to have the benefit of dental service by giving them dentists and not dental hygienists.

It seems to us the advocate of the dental hygienist and the oral hygiene propaganda has absolutely befogged the issue. If the small amount of service the dental hygienist can render in polishing the surfaces of the teeth is a good thing for the public, it certainly would be a better thing for the public, to give them the entire dental service by taking care of the cavities and fillings and things that are needed. The polishing of the occlusal surfaces of the teeth is not the only prophylactic service, and consequently the dental hygienist fails in the beginning as being unable to render a service that is going to be of any great value to the public.

We mentioned in the first part of this editorial that the dental profession or those who advocate dental hygienists seem to be afraid of their own propaganda, because they insist upon the dental hygienist working under the supervision or jurisdiction of a licensed dentist. We realize that there is danger of the dental hygienists taking things into their own control, and having laws changed to make them independent of the dental profession, but this part of the argument has no fear for us and is not advocated as the reason against establishing the dental hygienist. It would probably be a good thing for the dental profession if the dental hygienist would get away from the profession and try to carry on an

independent propaganda by themselves, because then the public would very soon see that the wonderful things that they claim to accomplish are not accomplished and the dental hygienists would simply hang themselves with their own doctrine. We wish to say that this editorial is not directed against the individuals who unfortunately, have been led to take the course in dental hygiene and who are made to believe they are rendering a wonderful service to the public, because they have been sold something under a false pretense, and if they succeed in making anything out of it in spite of everything and the small latitude in which they have to work, they are to be congratulated and not condemned.

In closing we shall say that we are opposed to the dental hygienist propaganda because it is a false doctrine and is not benefiting the public as we are led to believe, and if the public is in need of dental service and dental education, dental clinics must be established and dentists placed in those clinics, who are able to render real service, and not some one who can render but a partial and questionable service.

ORTHODONTIC NEWS AND NOTES

The editors desire to make this department a permanent feature of the Journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

Meeting of the American Society of Orthodontists

The Twentieth Annual session of the American Society of Orthodontists was held at the Edgewater Beach Hotel, Chicago, Ill., April 5, 6, and 7, 1920. The session was called to order by Dr. John V. Merzhon, President. The report of the Board of Censors showed the following result of the mail election: Dr. J. Lowe Young, of New York, President; Dr. Martin Dewey, President-elect; Dr. Ralph Waldron, Secretary; Dr. Bert Abell, Treasurer; Dr. Guy Hume, Member of the Board of Censors. It was practically unanimously voted to hold the next meeting at Atlantic City, N. J., some time about the first of May, 1921.

Meeting of the Alumni Society of the Dewey School of Orthodontia

The Tenth Annual Meeting of the Alumni Society of the Dewey School of Orthodontia was held at the Edgewater Beach Hotel, Chicago, Ill., April 1, 2, and 3, 1920, with the President, Dr. E. G. Weeks, in the chair. The program as prepared by the Program Committee proved exceedingly interesting. The election resulted as follows: Dr. S. W. Bradley, Ottawa, Canada, President; Major J. D. Eby, Washington, D. C., President-elect; Dr. Geo. F. Burke, Secretary-Treasurer. The time and place of the next meeting will be decided later by the executive committee.

Notes of Interest

Dr. Carl E. Ludt announces the removal of his office to 1533 David Whitney Building, Detroit, Mich., where he will practice orthodontia exclusively.

Dr. C. F. Sweet has announced the limiting of his practice to exodontia, radiodontia, and orthodontia, with offices in the Robbins Block, Minot, North Dakota.

Dr. Harvey A. Stryker announces the opening of an office at 317 Cutler Building, Rochester, New York, for the practice of orthodontia exclusively.

Dr. Joseph E. Brady has opened his office at 1145 David Whitney Building, Detroit, Mich.

Dr. Philip L. Salzberg announces his location at 67 Hanson Place, Brooklyn, New York. Practice limited to orthodontia.

Dr. Leonard T. Walsh, Pueblo, Colorado, announces that he will limit his practice to orthodontia.

Dr. Edward A. Moeller, 899 Woodward Ave., Detroit, Mich., is specializing in orthodontia.

Dewey School of Orthodontia Scholarships

The Dewey School of Orthodontia of New York City has offered annual scholarships to the members of the Dental Corps of the Army and Navy, the selection to be made by the Surgeon Generals of the respective arms of the service.



DR. J. LOWE YOUNG, OF NEW YORK CITY
President of the American Society of Orthodontists, 1920

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ORIGINAL ARTICLES

PRINCIPLES OF ORTHODONTIA IN THE TREATMENT OF MAXILLO-FACIAL INJURIES*

BY JOSEPH D. EBY, MAJOR, DENTAL CORPS, UNITED STATES ARMY
*Walter Reed U. S. Army General Hospital,
Washington, D. C.*

THE subject of "The Principles of Orthodontia in Maxillo-Facial Surgery" which has been selected for me to present to you today, covers such a broad field, possesses such an enormous quantity of material and carries with it such an obligation, that it will be impossible, within any reasonable time, to even present the fundamental principles by comparison with those of orthodontia.

In order that I may not be misunderstood, I wish to qualify that which I may present to you by stating in the outset that the successful treatment of maxillo-facial injuries in all of the nations engaged in the world war was founded in the recognition of orthodontic principles. Without dwelling in detail on this fact, let me state that this work owes a very great deal to orthodontia, and now orthodontia owes sufficient to maxillo-facial surgery to digest the work which has been done with the view of profiting by experience, and to standardize basic principles.

Every specialty in the healing art is bounded on all sides by other specialties, and this subject is a portion of that phase of orthodontia which borders upon oral surgery. This work has presented greater than ever before the indispensable value of cooperation between groups of specialists, and it behooves the orthodontist both in justice to himself and to his specialty to be prepared to cooperate with other specialists in this branch of work, and as it appears to one who can fully realize by experience that the orthodontist is fundamentally better qualified for this work. This subject should be very seriously considered by orthodontists and should always be incorporated in postgraduate courses of orthodontia.

*Read before the Annual Meeting of The Alumni Society of the Dewey School of Orthodontia, April 1, 2, and 3, 1920, Chicago, Ill.

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of maxillo-facial injuries the analysis of this definition implies that the mechanical work should prevent as many complications as is possible in the emergency treatment, and should then correct the deformities.

In orthodontia, etiology is a very broad subject, and is the first step in diagnosis. In maxillo-facial injuries the primary causative agent is some form of external violence which produces conditions which must be recognized in the form of classical symptoms and conditions to be overcome. For this the orthodontist must possess an intimate knowledge of the structural formation of the bones of the face, and an intimate knowledge of the relations to, and the effects of, the muscles operating both collectively and individually in the control of the movements of the bones.

In orthodontia, diagnosis is founded upon normal occlusion as the ideal to which to aspire. In maxillo-facial surgery, diagnosis is founded upon restoring the *original* occlusion, assuming in both instances that the harmony of the fea-

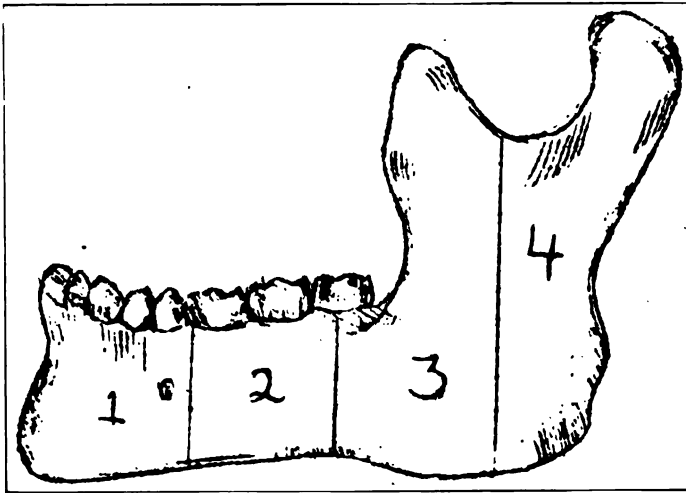


Fig. 3.

tures will be controlled desirably by the results accomplished in the substructures. In the superior maxillæ, fractures may be classified as horizontal and vertical or their combinations, and diagnosis based upon the return of the displaced fragments to their original positions. In the mandible, fractures may be classified by two methods, each of which are thoroughly comprehensive and it may be stated that both methods require perfection. The French have adopted a very effective method of classification using the muscular attachments as the basis. By dividing the mandible into sections to which the depressing and elevating muscles are attached, their classification is:

- (A) Interdepressor Fractures
- (B) Preelevator Fractures
- (C) Interelevator Fractures
- (D) Postelelevator Fractures

Figs. 1 and 2 illustrate the muscular attachments of the outer and inner sur-

faces of the mandible. Interdepressor fractures are those through the symphysis between the digastric fossæ which are influenced by the depressor muscles attached through that region as shown in Zone 1 of Fig. 3.

Preelevator fractures are those situated through the body of the mandible the anterior segments of which are influenced by the depressor muscles, the posterior segments influenced by the elevator muscles as shown in Zone 2 of Fig. 3.



Fig. 4.

Interelevator fractures are those fractures through the ramus which traverse the insertion of the masseter and internal Pterygoid muscles as shown in Zone 3, Fig. 3.

Postelevator fractures are those through the sigmoid notch and the neck of the condyle as shown in Zone 4, Fig. 3.

This classification affords a very comprehensive study of the lines of displacement by the uncontrolled action of groups of muscles with the result that a certain standardization of orthodontic apparatus may be adopted accordingly.

The above classifications deal with the mandible through the medium of its muscular attachments and not with the bone itself. If we consider the fact that we are dealing with the bone as the site of injury, and the muscles as a condi-



Fig. 5.

tion, it seems that the classification of fractures should be founded within the bone. By dividing the bone into the symphysis, body, and ramus, fractures should be classified as Classes 1, 2, and 3, respectively, and each of these classes should be subdivided sufficiently to give definite location and to recognize the oblique lines of fracture both bucco-lingually and inferior-superiorly. When this classification is perfected and recognized as the standard, then it will be possible to standardize methods of splinting on a corresponding basis.

In orthodontia, tooth movement and retention is the object to be effected, by means of the anchorage of certain mechanical apparatus upon the teeth. In maxillo-facial surgery, the movement of bone fragments *en masse* and their retention is the object by the attachment of mechanical apparatus on the teeth. The problems of anchorage are similar in many respects, but vary with conditions of environment, etc. Insofar as dynamics are concerned, the use of the screw and ligature which we consider intermittent forces is naturally indicated for immediate traction along the lines of reduction, and for control during retention. When fractures are partially solidified in malposition or where adhesions cause malposition, the principles of dynamics must be exactly the same as in the movement of individual teeth for which a mild constant stimulus of an elastic or spring force is indicated, the same physiologic processes being called into action in their gradual reduction and the growth of new bone.

In orthodontia, the principles of retention are to secure teeth in their desired positions, preferably allowing certain actions in the forces of occlusion for finer adjustment and a stimulus for bone growth. In maxillo-facial surgery, the identical principles are best, but vary in purpose and duration. If there is a simple fracture, retention is complete upon solidification. If there is loss of substance in the bone, retention is complete upon the fusion of the fragments by the growth of new bone after surgical procedure.

The foregoing comparisons describe how intimately the treatment of more extensive injuries is similar, with slight variations, to every detail in orthodontia and it has been noted without a single exception among the operators treating maxillo-facial injuries that those men with the knowledge of orthodontia who recognize the most effective treatment in their diagnosis, will apply the best forces over the best anchorages, will always show due regard for the patient's comfort in the production of simplest forms of apparatus effective in all requirements, whereas the operator without the knowledge of orthodontia applies poorly selected forces over clumsy anchorages, and will usually construct fantastic apparatus of no basic design, operating materially against the patient's and his own comforts.

I wish to submit a few illustrations to endeavor to substantiate the foregoing comparison, and to present a few cases in the review of these principles. These slides are submitted to be considered from the standpoint of general principles and do not represent any effort to enter into details, for so broad is the scope of this subject that nothing less than a text could contain it.

SUPERIOR MAXILLARY FRACTURES

In the classification of superior maxillary fractures as Horizontal, Vertical, and Horizontal-vertical, the Kingsley principle of cranial anchorage applies uni-

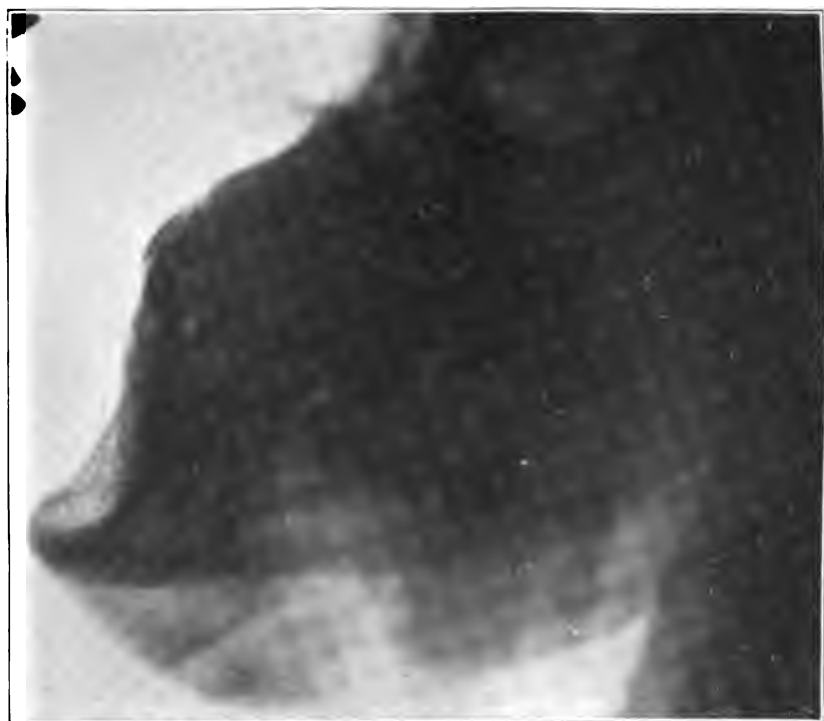


Fig. 6.



Fig. 7.

**Fig. 8.****Fig. 9.**

versally. A great deal could be written on the subject of technic in the assemblage of these component parts.

Fig. 4 illustrates a method for the expedition of time without sacrifice of principle in the view of conserving lengthy technic, treating the patient imme-



Fig. 10.



Fig. 11.



Fig. 12.



Fig. 13.

diately, or in performing the greatest good to the greatest number. This method embraces the use of an impression tray intraorally united to the teeth by means of modeling compound and connected to the cranial cap made of plaster bandage by means of heavy outer wires and nonelastic ties.

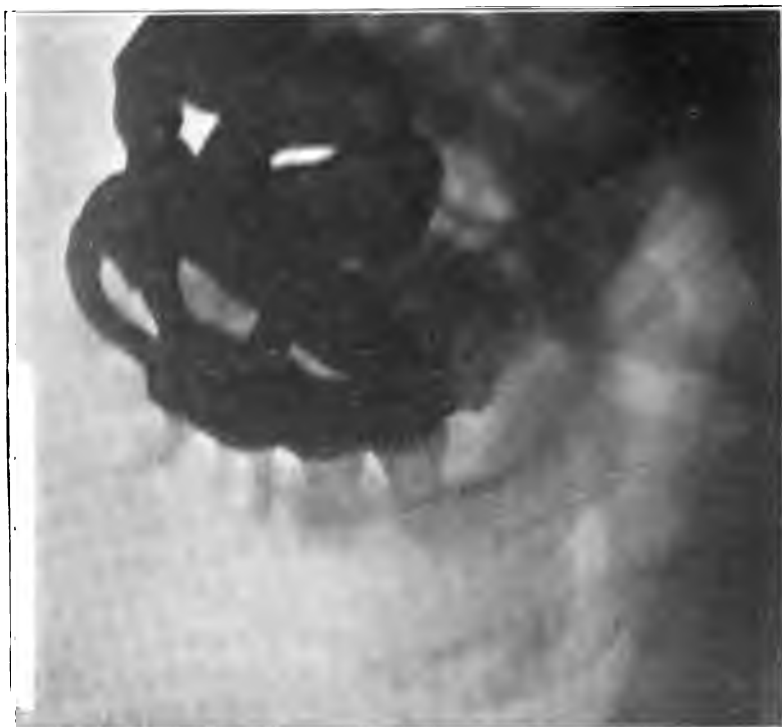


Fig. 14.

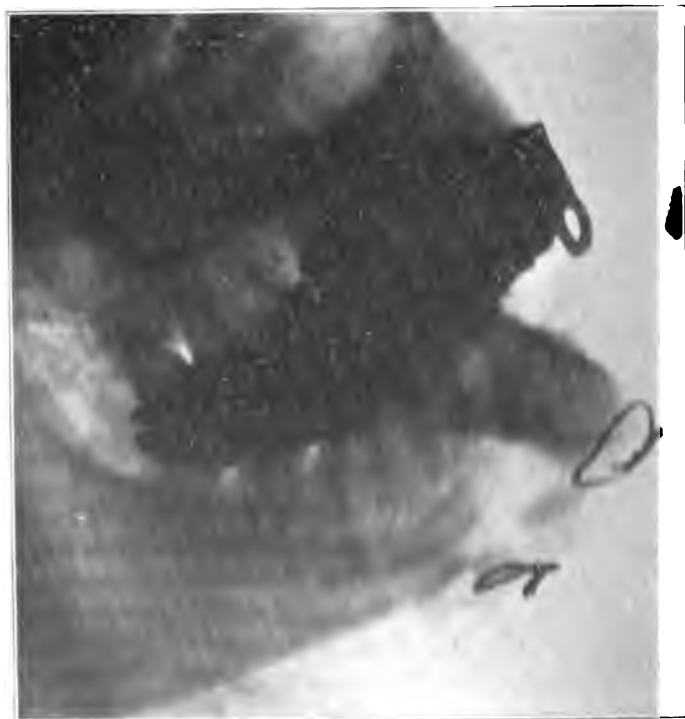


Fig. 15.

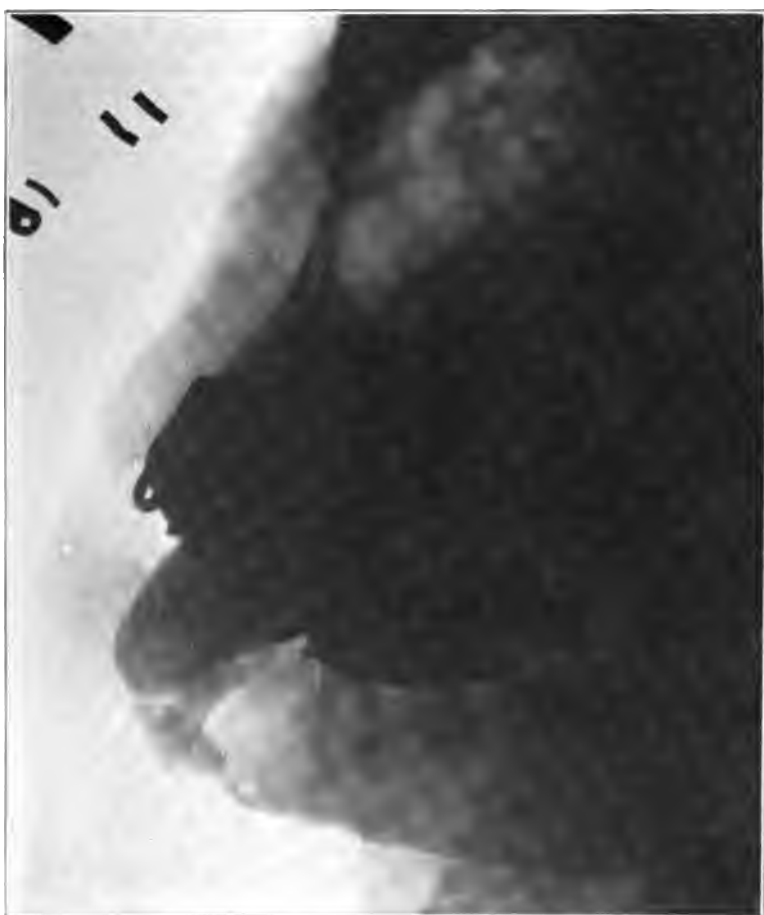


Fig. 16.



Fig. 17.

FRACTURES OF THE MANDIBLE

Fig. 5 illustrates a multiple fracture of the mandible, but is intended primarily to show the interdepressor fracture through the symphysis.

Figs. 6 and 7 illustrate preelevator fractures through the body and angle of the mandible, respectively.

Fig. 8 illustrates an interelevator fracture through the ramus from the sigmoid notch to the inferior border.



Fig. 18.

Fig. 9 illustrates a postelevator fracture through the neck of the condyle.

Fig. 10 shows loss of substance through interdepressor region.

Fig. 11 illustrates collapse of the lateral sides of the arch by the action of the remaining depressor muscles.

Fig. 12 shows apparatus designed for the above case on the basis of original occlusion. Cast encapping splints made for the upper arch, and the two segments of the lower arch with interdigitating tubes soldered to the upper and lower buccal surfaces through which lock-pins are inserted to immobilize the stumps of

the mandible securely. After cementing these caps to position, the stumps of the mandible were pressed laterally, and a stationary anchorage "lock-bar" was inserted into slots in the forward ends of the lower caps, apparatus designed on the basis of orthodontia.

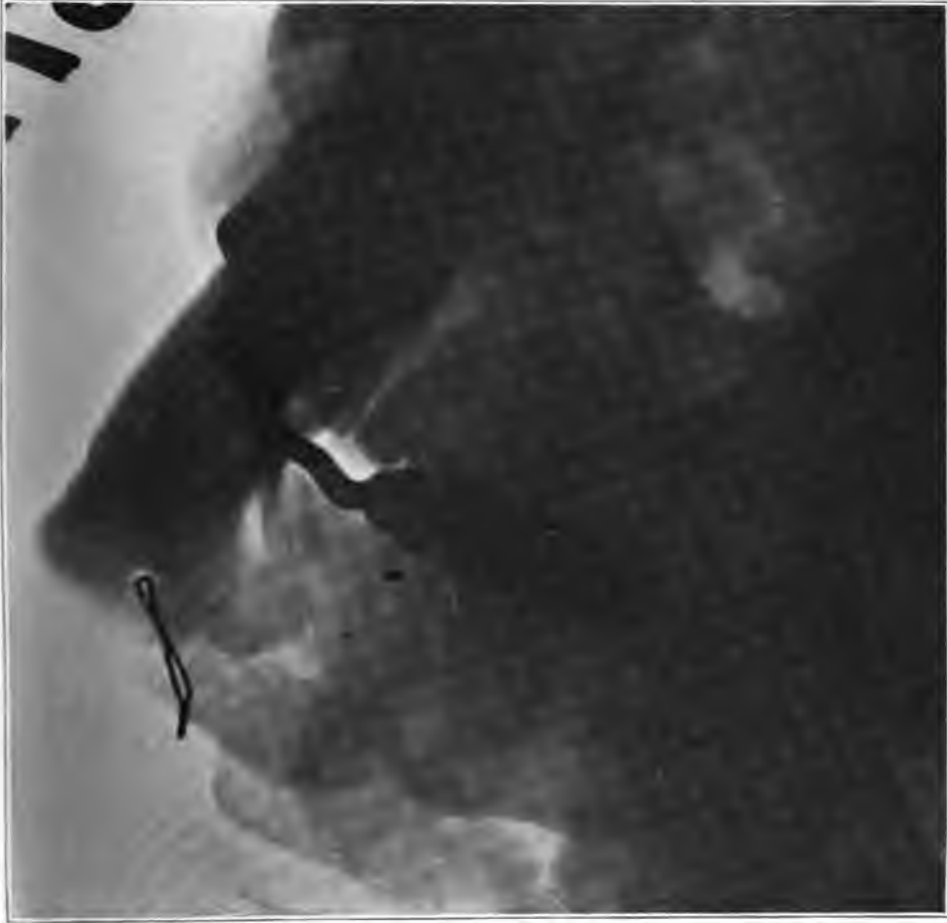


Fig. 19.



Fig. 20.

Fig. 13 shows apparatus in position.

Fig. 14 is a radiograph illustrating loss of substance through the symphysis also the "open-bite" splint made in the A. E. F. and worn by the patient during his transportation to America.

Fig. 15 illustrates operation intrapharyngeal, ether-oxygen, curved incision in neck, skin elevated, ends of bone freshened, scar tissue excised, and a pane



Fig. 21.



Fig. 22.

of the inferior border cut from one stump and shifted on a pedicle of muscle and fascia, and wired to the opposite stump.

Fig. 16 is a radiograph taken seven months later showing genesis of new bone, solidifying the ends completely. Operation performed by Lt.-Col. Robert H. Ivy.

Fig. 17 illustrates path of missile through interdepressor region.

Fig. 18 illustrates loss of substance through symphysis.

Figs. 19 and 20 illustrate bone graft from the anterior superior spine of



Fig. 23.

the crest of the ilium, also note design of mechanical apparatus based on the orthodontic principles of stability of anchorage and simplicity of design.

Fig. 21 shows point of exit of high explosive fragment through mandible, appearance of sinus before healing.

Fig. 22 shows interdental apparatus illustrating an effective plan of control of occlusion and facial harmony by the prevention of the collapse of the left half of the mandible.

Figs. 23 and 24 represent antero-posterior and lateral views illustrating free rib graft.

Fig. 25 shows models visualizing the operation.

Fig. 26 illustrates loss of substance of mandible in the pre-elevator region with overseas splint in position made by swedging thin upper and lower metal caps reinforced with solder to which were attached hooks pointing upward and downward at correct angular relations. This apparatus was designed on the basis of correct occlusion and by means of attaching intermaxillary elastics afforded



Fig. 24.



Fig. 25.

a safeguard against liabilities of strangulation, and at the same time the preventive value of its work properly done made the resultant treatment of the case very definite and accomplished in a minimum of time.

Figs. 27 and 28 are photographs of patient. Note the retention of occlusion and facial contour. This apparatus accomplished the fundamental object of an emergency splint in that it placed the teeth and bone fragments in as nearly their



Fig. 26.



Fig. 27.



Fig. 28.



Fig. 29.



Fig. 30.

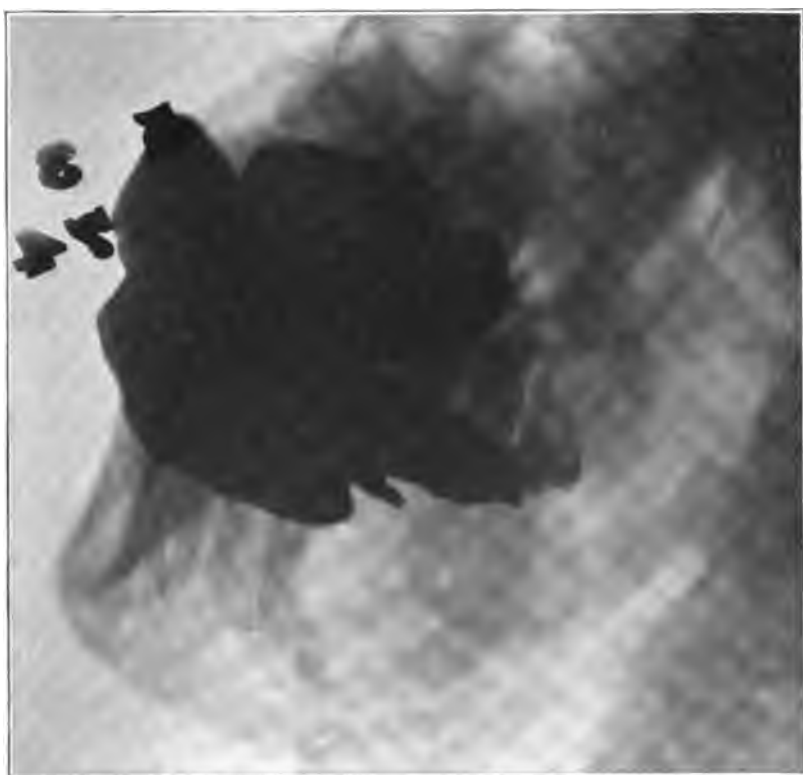


Fig. 31.

normal positions as possible and the overlying soft tissues in a normal state of rest.

Fig. 29 is a radiograph of case of the same type as that shown in Fig. 2 (preelevator) showing the "open-bite" splint inserted for transportation to the United States as a safeguard against strangulation. This splint was designed at the sacrifice of all principles of orthodontia in that the elevator and depressor muscles pull the fragments out of position and place the muscles in position which would cause spasm and soreness as well as a decidedly uncomfortable patient. This fracture solidified with the result that instead of the ramus and



Fig. 32.

body occupying vertical and horizontal positions functioning on the same radius as that of the opposite side, a permanent "open-bite" nonocclusion resulted with the result that an apparatus had to be inserted with reciprocal elastics adjusted to draw the teeth into occlusion. This splint prevented strangulation, but from an orthodontic standpoint it required much follow-up work to overcome its defects.

Fig. 30 shows the appearance of patient having worn the apparatus for ten weeks. Figs. 29 and 30 are inserted as a comparison to draw a distinction between Figs. 26, 27, and 28 with the excellent results from the "closed-bite" method.

Fig. 31, same case as Fig. 27, and illustrates the implantation of three pieces of osteo-periosteum removed from the tibia and planted into pockets between the

periosteal borders of the freshened stumps, one to the lingual, one to the buccal, and one to the inferior border.

Fig. 32 is a radiograph illustrating genesis of new bone four months later.

Fig. 33 is a photograph of model visualizing the operation.

Fig. 34 illustrates point of exit of high explosive fragment, loss of substance pre-elevator region. The action of the elevator muscles elevates the ramus upward and inward with the result that there is formed a deep concavity



Fig. 33.

on the side of the face and the radius between the right head of the condyle and symphysis becomes shortened. On the basis of normal occlusion and facial harmony it is indicated to force the ramus downward and backward with the head of the condyle as a center of rotation. The force to be applied must be directly against the action of the temporal muscle particularly.

Fig. 34 shows the mounted splint illustrating the general principles of simplicity of design for the control of posterior edentulous fragments. The superior arch is used for anchorage and the opposite segment of the lower arch is secured

into normal occlusal relations by means of interdigitating tubes to the buccal surfaces through which a lock-pin is inserted. In order to gain a stationary anchorage, these tubes and lock-pins should be square. A cast silver or vulcanite saddle is made for the external oblique line of the ramus and attached by means of a swivel to a compensating screw which, when tightened, will apply a force



Fig. 34.

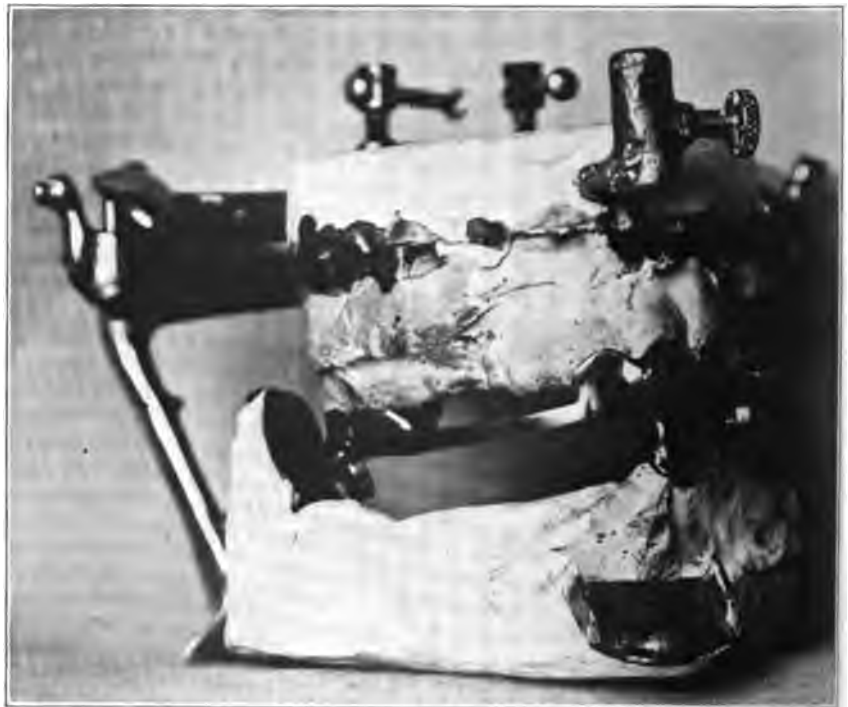


Fig. 35.

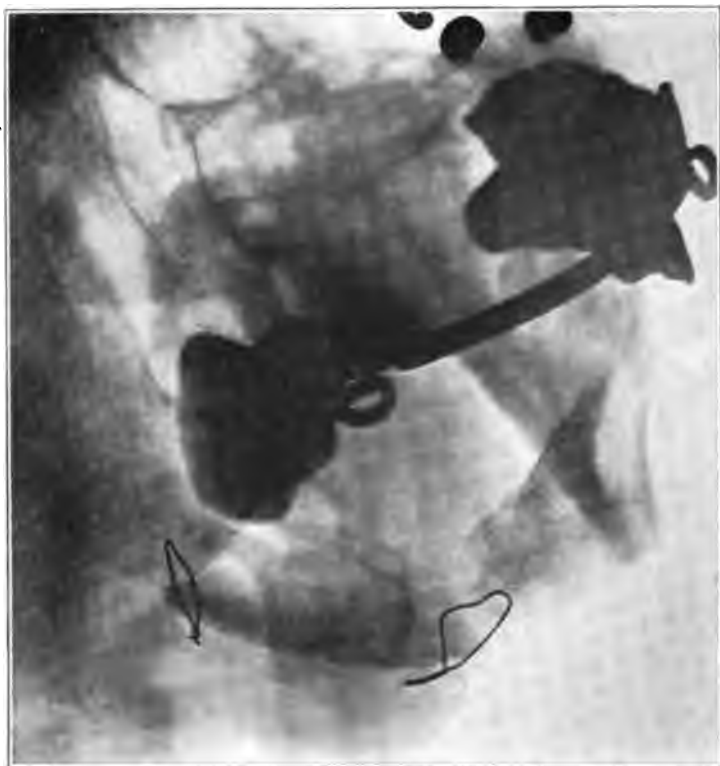


Fig. 36.



Fig. 37.



Fig. 38.



Fig. 39.

at right angles to the external oblique line, and as the ramus is forced backward on the head of the condyle, the swivel attachment will allow the saddle to remain at rest against the soft tissues at all times. This is a very effective method for simple stability, but is very painful and injurious to the soft tissues for traction, therefore, it is better to insert a sharp platinum tip into the bone when extensive movement has to be made.

Fig. 35 illustrates photograph of apparatus on articulated models employed in a case to hold the ramus steadily during operation.

Fig 36, lateral view, shows apparatus in position, also the bone graft inserted from the crest of the ilium.

Fig. 37, photograph visualizing iliac operation.



Fig. 40.

Fig. 38 shows loss of substance in preelevator region.

Fig. 39 shows panel of bone shifted from anterior segment under the stability of intermaxillary wiring.

Fig. 40 illustrates the genesis of new bone and solidification in two months.

Fig. 41, model visualizing operation.

Fig. 42 shows point of exit of high explosive fragment in preelevator region.

Fig. 43, a radiograph illustrating sequestra and loss of substance. It will be noted that there is a vital, well-invested molar in the posterior segment.

Fig. 44 shows occlusal view of the splint disassembled. From the viewpoint of anchorage it will be noted that the cervical borders of this silver triple gold

plated casting is not scalloped, the border being left smooth to protect the cervical gum borders and to fill the interproximal spaces with cement for security of attachment. It will also be noted that interproximal set-screws are provided to be screwed between the teeth while the cement is still soft, these are sometimes essential for the assured security which the seriousness of the operation necessitates. Where there is only one tooth standing alone a cast cap necessarily has to rely upon the cement for security, whereas a band may be attached more securely.

Fig. 45 presents view of splint, right side, illustrating plan of loosening the



Fig. 41.

nut on the front end of the tube and then by tightening the nut on the posterior end, the ramus is forced backward, thus overcoming the action of the elevator muscles.

Fig. 46 illustrates left view of splint showing the buccal flange designed to control occlusal and facial harmony by preventing the collapse of the left segment. It would have been easily indicated to have inserted a cumbersome interdental splint in this case which would have interfered with the patient's comfort to the extent of becoming serious in the consideration of the success of the operation; therefore, it is believed that this apparatus was orthodontically correct.

Fig. 47 shows operation, intrapharyngeal, ether-oxygen, curved incision in neck, skin elevated, scar tissue excised, ends of bones freshened and the shadows of two pieces of osteoperiosteum from the right tibia may be seen between the stumps.

Fig. 48 is a radiograph made five months later. Note the genesis of new bone in the bed of the graft.

Fig. 49 shows radiograph taken eight months after operation, growth of new bone having solidified the fragments securely in normal occlusion. At this



Fig. 42.

stage it was possible to loosen the posterior fracture band, and by rotating it off of the tooth, the jaw could be tested, and if found loose, the splint could be quickly recemented.

Fig. 50 shows completed case. Operation Lt. Col. Robert H. Ivy.

Fig. 51 shows preelevator loss of substance of mandible from osteosarcoma. Radiograph illustrating an ox bone graft, and it will be noted that absorption is taking place, this is not an autogenous bone and Nature will not tolerate it because it is incompatible with human tissues causing atrophic absorption.

Fig. 52 is a radiograph illustrating loss of substance in interelevators region of the mandible.

Fig. 53 illustrates gliding planes in the buccal sulci between the upper and lower encapping splints designed on the basis of normal occlusion and facial harmony.



Fig. 43.

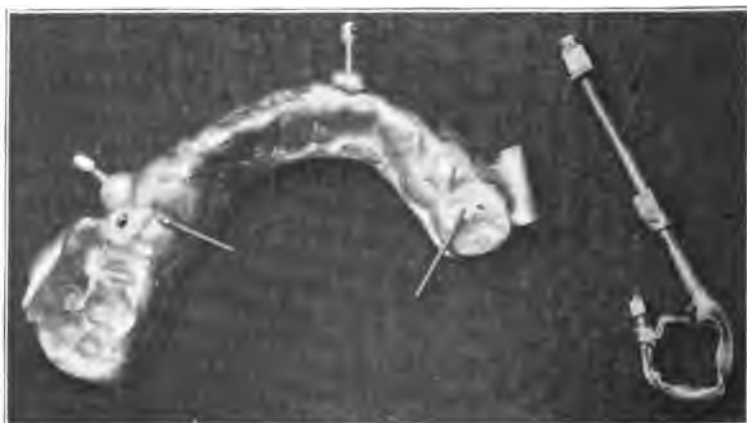


Fig. 44.

Fig. 54 illustrates a section of cortical bone from the tibia inserted into position.

Fig. 55 is a radiograph illustrating region of tibia from whence bone was procured.

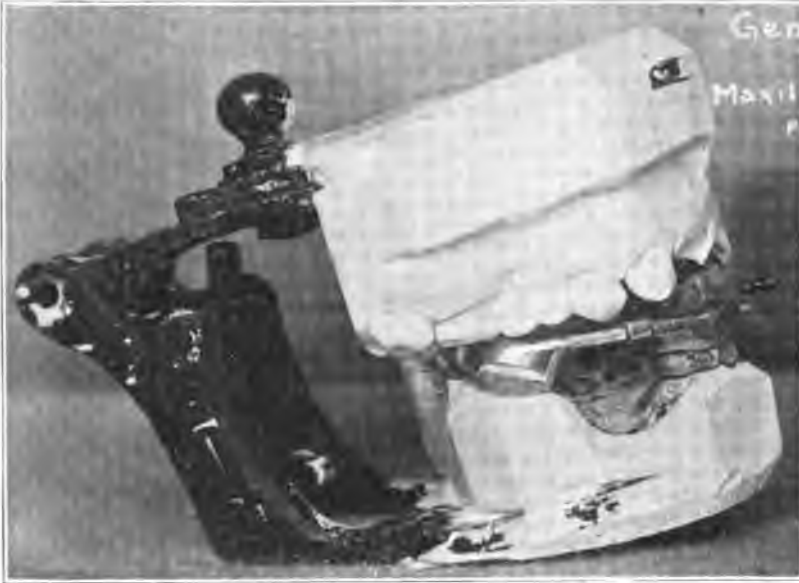


Fig. 45.



Fig. 46.

Fig. 56 shows loss of substance in postelelevator region of mandible wherein it will be necessary for patient to wear apparatus seen in the illustration permanently, and as a means of occlusal and facial control.



Fig. 47.



Fig. 48.

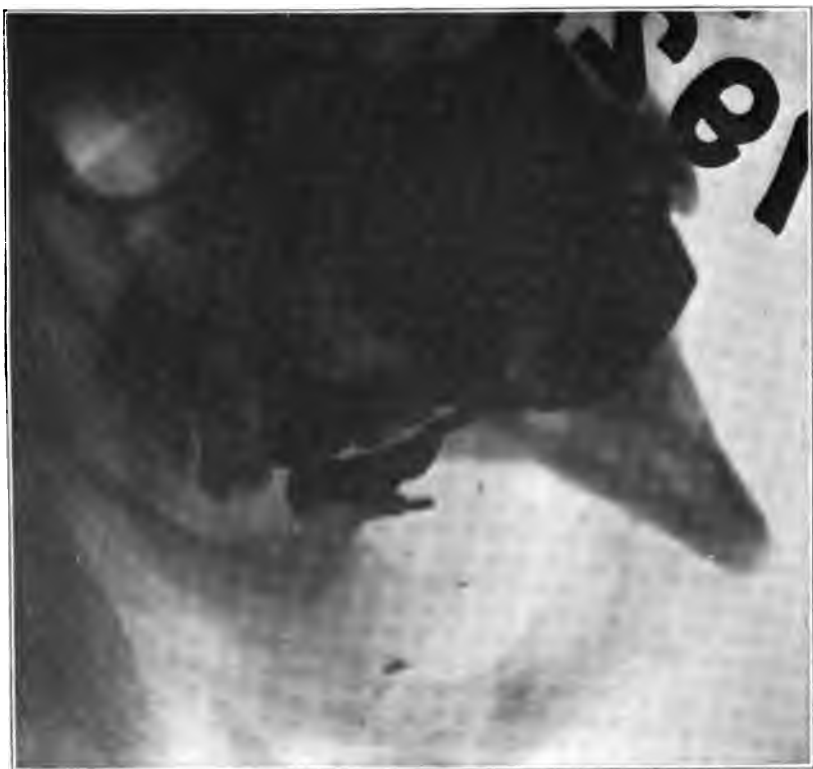


Fig. 49.



Fig. 50.

**Fig. 51.**

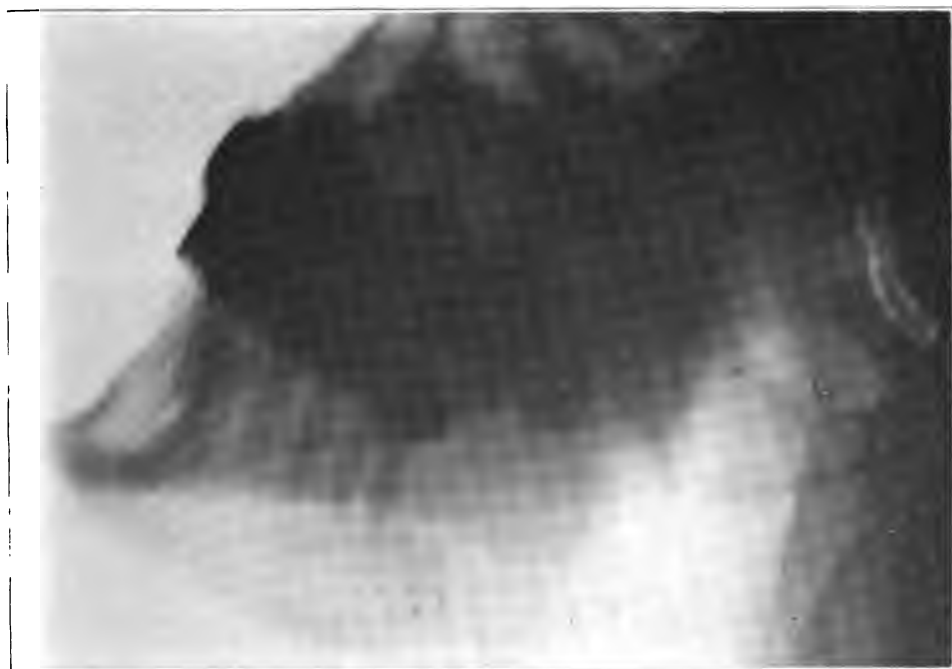


Fig. 52.



Fig. 53.

The foregoing cases illustrate fractures through the various regions of the mandible, also similar cases of loss of substance throughout the various regions. From the standpoint of classification these fractures were referred to by the French method which was not intended to infer that the other classification suggested will not become equally effective. These cases are shown to illustrate the fact that cast splints are far more effective than swedged splints, and the base material found is 90 per cent silver, and 10 per cent copper. These illustrations are also intended to give you a study of what has been found to be the best signs of casting, all splints must be gold plated. It is not at all infrequent in the final splinting apparatus for equalizing the occlusion and prolonged retention that the usual technic of bands for anchorage may be employed, but in the ear-



Fig. 54.

stages or where important operations are dependent upon the splints, it is possible to subserve the best principles of band technic, but it should always be employed when conditions are favorable.

These cases have also been submitted to your consideration for your careful study and food for your thoughts in the great question of bone growth and value which they may impart to you in comparison with the same subject in routine pursuits of orthodontia. It has been exceedingly difficult to endeavor to cover such a broad field in my earnest desire to impress upon your minds the great importance of this branch of orthodontia, and while we hope in time to be able to digest the details of this subject more thoroughly for you, it is hop-

that you will consider this effort as being an insight into the principles of the entire field only.

My personal desires and object are to interest you all in this subject wholesomely, and in conclusion, if you will pardon me for indulging in a bit of senti-



Fig. 55.

ment, I would like to state that I feel that the years which I have spent in orthodontia have been rewarded a hundred fold by the consolation which I have had in serving between three and four hundred patients in this work and the reward which came with successful treatment.

Upon the existence of future emergencies, it is practically assured that the specialists of orthodontia will be given sufficient preference and afforded suc



Fig. 56.

splendid opportunities in this service, until it behooves each of you to be prepared and I wish to further insist upon your very serious consideration of obtaining a commission in our Dental Reserve Corps.

DISCUSSION

Dr. H. L. Hosmer, Detroit, Mich.—It is with a feeling of regret that I open the discussion of this paper. Regret, because I find myself totally unqualified to do justice to such an excellent essay. Realizing more fully than ever before that my experiences in war surgery was, indeed, nothing in comparison with the work done by Major Eby, I wish to say that we men in the American Expeditionary Force made no attempt to treat the injured who were presented to us in the way the essayist has so magnificently and so clearly shown. They were treated at the Walter Reed General Hospital at Washington, D. C.

The work that has been shown us this afternoon proves beyond the shadow of a doubt the bigness of our profession, and has shown those who in former years have tried to belittle the dental surgeon in the Army by refusing him equal rank with the medical major that dentistry is a profession second to none, and fully deserves the recognition it now enjoys.

Major Eby's contention that the classification of fractures should be made according to the position they occupy in the bone, I believe, is a most excellent point, rather than the classification by muscular action, as used by the French. By his method one can readily tell the exact location of the fracture.

The essayist has clearly shown us the important place the orthodontist holds in the treatment of maxillo-facial injuries. The similarity of the appliances which we use to those employed in the reduction of fractures clearly shows that the orthodontist is a specialist best fitted to treat these kind of war injuries.

If you will but compare pre-war methods for reducing compound comminuted fractures, where there is much loss of bone tissue, with the cases Major Eby has shown, you will readily appreciate how much the world of science owes to the dental profession.

Consider the remarkable results obtained where bone inserts have been necessary. Eighty per cent of these operations have been complete successes, while the majority of the

remaining 20 per cent have only had to be freshened up, but could not be classed as complete successes.

The ingenuity employed in the construction of the different apparatus employed in the work shown us has the orthodontic abilities of Major Eby written all over them. The square tube and pin locking device employed in several of the cases is the most effective method I have ever seen, and much credit is due to the essayist for finding so simple and yet so efficient a means of locking the jaws together.

There is little that I can add to what the Major has so ably covered, but I feel I should not let the opportunity pass without some comment on the unselfishness of my good friend Eby. The war has been over now almost a year and a half, and we men who were in it have long since returned to our practices, feeling that we have done all that was required of us, with little thought of the poor fellows who were less fortunate than we. These men must go through life with the horrible and unsightly injuries they received in the defense of their country's honor. Fortunately for them, there were a few men, such as Major Eby, who were big enough, unselfish enough, and patriotic enough to see this work through, willing to carry on at a great financial sacrifice, and with no reward, except the gratitude of those unfortunate men whom they have so conscientiously and untiringly endeavored to reconstruct so that they may once more be presentable to society.

Dr. Woodbury.—It was my privilege to do constructive work along the line Major Eby has given us, and I am sure it has been a great privilege to have listened to him, because I have had the opportunity of removing a large number of appliances that have been made. It seems to me it is almost a new departure of dental surgery, in a little different sense than we see, developed by men like Major Eby and others. I think we are to be congratulated on having had this wonderful opportunity of listening to Major Eby and of seeing the illustrations.

Dr. D. S. Sterrett, Erie, Pa.—I have nothing to offer but a feeling of great gratitude to Major Eby, to Colonel Ivy, and other men who have been instrumental in intelligently and unselfishly taking care of and finishing up these men. I recognized some of them on the screen. I recognize now the small part some of us played in reconstruction work on these men.

The methods which were employed were limited to two things, one the material which we had to work with; another I think was inspiration. Whatever training a man may have had previously in caring for these cases, we acted comparatively involuntarily in the way we handled them. Some of these men came across in good shape. They were easy to work on, largely the result of the two factors I have mentioned, and not to any particular sagacity or knowledge or experience on our part. Where the men had the wrong thing done to them, it was borne with fortitude, and it makes me all the more appreciative of the work of the men who took them apart and fixed them up right.

Dr. Asa A. Lagrow, Oak Park, Ill.—I have not had any experience along the line Major Eby has described in the Walter Reed Hospital. I fully appreciate the great value of the work he has done for the boys in taking care of them and in making life worth while for them afterward. His great amount of scientific knowledge and the data that he is compiling will be invaluable to us in years to come. It will be of great importance to us, more especially because the knowledge they have gained could have been gained perhaps in no other way. I am sure it is through the unselfish and untiring efforts of men like Major Eby that these records are being compiled.

Dr. H. G. Metz, Pittsburgh, Pa.—It is gratifying to me to see the results that have been obtained by men like Major Eby and his associates. Any one who saw these cases in the field and in base hospitals can appreciate what this work is. The limited supplies we had and the conditions under which we had to handle these cases, left a deep regret in our hearts that we could not do more for them. We were limited as to the time we could keep these cases, but certainly it makes me feel good to see the things which these men did and the results that were accomplished. It takes a great load off our minds to see these results, and if we could only see equally good results in the cases of other men we would feel much better.

Dr. William C. Fisher, New York City.—I was in charge of one of the largest hospitals in this country, and we had passed through that hospital thousands of wounded men coming back from abroad. We had a large percentage of these maxillo-facial cases. I had the good fortune to observe the work of nearly every prominent man or corps of men on the other side, men like Hume and many others, and I also had the great pleasure of seeing Major Eby's work, and I am sure he does not have to take second place to any of them. (Applause.) You can add to that the almost perfect work of Kazanjian, the perfect work of Hume; and the work of this man is just as perfect and possibly a little more so because he has stuck to it a little longer.

I had the pleasure a few weeks ago of seeing one of Major Eby's cases in my office and really the reconstruction work on that man was the most beautiful thing I have ever seen. He was a tall handsome fellow, and his facial deformity was so slight that you would hardly notice it until he turned his face to you and you got a full view. That young man has been restored and has become so interested in the work of assisting Major Eby in making appliances for the other men, he has become almost an expert mechanical man and will begin the study of dentistry under the guide of the government this coming year, all simply through the inspiration of this man Eby. (Applause.)

Dr. F. C. Rodgers, St. Louis, Mo.—I wish to express my feelings of admiration for what Major Eby has done and is doing. We have heard a great deal about war heroes, but very seldom do we hear mentioned the heroes of peace. Dr. Eby embodies both. He is a war hero because he gave up everything that life possesses to enter the army during the war, and now that the war is over he has given up everything that is dear to life to remain in the service to finish the noble work which inspired him to take it on during the stress and excitement of the war. He has erected a monument which will be lasting for the dental profession, and orthodontia in particular, and I feel we should try everything in our power to recognize and honor such a man and show our gratitude for the service he has rendered to humanity and to the profession. If there is any one individual that deserves a Distinguished Service Cross or a Distinguished Medal for the work he has done, Dr. Eby is entitled to all the honors that can be conferred upon him by the United States government. (Applause.)

Major Eby (closing the discussion).—Gentlemen, I am absolutely unable to make anything like a reasonable reply, except to express my feeling of gratitude and appreciation for your kind expressions which are deep in my heart.

It would be utterly remiss at this time if I did not myself pay tribute to the work of the men overseas, realizing the various handicaps they had to overcome and the tremendous determination that soldiers displayed.

I wish to thank those of you who have had so many kind things to say in this discussion and for your expression of good will.

So far as any reward is concerned, I have not expected any reward. I do not want it. All I ask is the good will of the patients and your good will. What I may have done has been done all the while in the interest of orthodontia and our profession. The only way I can return the honor conferred upon me is to dedicate it to the Dewey Alumni Society. (Applause.)

PRESIDENT'S ADDRESS BEFORE THE AMERICAN SOCIETY OF ORTHODONTISTS, CHICAGO, ILL., APRIL 4-6, 1920

BY JOHN V. MERSHON, D.D.S., PHILADELPHIA, PA.

IT IS with a feeling of deep appreciation that I accept the honor you have conferred upon me by selecting me as President of The American Society of Orthodontists, and I extend to the members and our guests a most cordial welcome.

Our objects in attending these meetings are many; first, and by no means the least important, that we may meet old friends and renew our friendship with those we have learned to love, and receive that inspiration which comes to men's souls from contact with the high type of manhood with which this society is so richly blessed.

We come here that others may help to solve our problems for us, and that, perchance, we may help to solve the problems of some of our fellow members. Our problems are many. We are here not only to solve our own problems, but the entire dental world is looking to this organization to solve the orthodontic problems and to direct and teach them, and this is a responsibility that we must assume. We must remember that we, as specialists, are only practitioners in a special department, and that our patients are in the hands of the general dentist before they come to us.

THE RELATION OF FOCAL INFECTIONS TO MODERN ORTHODONTIC PROBLEMS

This organization must direct the general practitioner as well as the undergraduate student in the problems of pre-orthodontic treatment. In the past the orthodontists have impressed upon the dental profession the necessity of saving and restoring all teeth to their original size and contour, especially the first molars and all deciduous teeth. The development of the last few years has impressed upon the profession as well as the laity that certain diseases and organic lesions have their origin at the apices of infected teeth and these conditions have presented several new problems to the orthodontist.

In the case of first permanent molar teeth in which the pulps are dead and infected prior to the eruption of the second molars, the orthodontist from the standpoint of occlusion and development would recommend them to be filled, but with the possibility of infection from these teeth another problem is presented, and from the standpoint of the pathologist these teeth should be extracted. If extraction is the final decision, at what period in relation to the eruption of the second molar should the extraction be done? and what is the correct procedure to adopt in the orthodontic treatment of these cases?

The attitude of the orthodontist in the past regarding the deciduous teeth has been very much the same as with the permanent molars, namely that we must fill all nonvital deciduous teeth; that no matter how badly broken down these teeth may be, they should be restored to their original size, shape, and contour. This would be permissible if we were studying the problem of ortho-

dontia purely from the standpoint of occlusion, but our problem is one of functional development, and anything that interferes with the development of the child is a causative factor in malocclusion.

Infections are one of the most common causes of organic disturbances which have a retarding influence upon the growth and development of children. A deciduous tooth with infected roots is most difficult to treat and fill so that we can be assured that the possibility of infection and the constitutional disturbances resulting therefrom have been eliminated, and from this standpoint it has been my practice and advice to have all deciduous teeth with nonvital pulps removed. I should like to have this subject discussed at this meeting as this organization is very largely responsible for the efforts of the general practitioner, and sometimes against his better judgment, to save all first molars indefinitely, and to retain all deciduous teeth until time for the eruption of the teeth of the permanent series irrespective of apical conditions.

PREPARATION FOR THE PRACTICE OF OUR SPECIALTY

Years of experience in general practice and in the specialty of orthodontia have impressed me with the necessity of the undergraduate student receiving a thorough comprehension of the orthodontic problem so that when he continues his work in special schools these institutions can devote their attention to teaching real postgraduate subjects and clinical work, rather than having him teach subjects which should have been taught in the undergraduate institution. I disapprove of dentists specializing in orthodontia as soon as they graduate from the dental college and before they have had any experience in dealing with the large variety of conditions which may exist in the oral cavity, and which one never has the opportunity of observing and studying in the practice of orthodontia, unless the postgraduate school includes in its work one or two years of practical work in a dental infirmary. In orthodontia we see only children and those children that are defective in their development; we have no opportunity of knowing what possible conditions may arise in the mouth through the rest of the life history of the individual, and that is most essential. If a man has had a number of years' experience in the general practice of dentistry, he has seen the masticatory organ in all of its different phases of development, under all conditions and circumstances. He has seen what a child of six will be at ten, what a child of ten will be at fourteen, and what one of fourteen will be at twenty-five; and he has had a better opportunity to study the function of the masticatory apparatus. The orthodontist sees the denture when they are at their best and when we dismiss them they are only just starting upon their life's journey.

ORTHODONTIA INSEPARABLY RELATED TO DENTISTRY

The opinion seems to prevail that orthodontia is something different, apart, separate and distinct from dentistry. Orthodontia is just as much a part of dentistry as dentistry is a part of medicine, or as surgery is a part of medicine; they are all a part of the healing art and can not be dealt with separately any more than we can separate the various organs of man and have him persist. The orthodontist should keep in touch with the progress and changes in general

dentistry, and to that end he should be just as constant in his attendance at dental society meetings as the men in general practice.

I have so frequently heard it expressed, and it seems to be a prevalent opinion, that one can attend a post-graduate school of orthodontia and in a comparatively short time become a proficient orthodontist. I want to disabuse the minds of the men who are anticipating going into orthodontia of this impression; it can not be done. If there is so little in the orthodontic problem that a student who has just graduated from a dental college without any experience can in a few weeks become qualified to do the work satisfactorily, then orthodontia should not be considered a specialty. If this were true, the undergraduate schools could by giving a selected course qualify men for the practice of orthodontia as well as the postgraduate schools. While I am quite willing to admit that the majority of the men who belong to this organization did not have a very long course of instruction, I think the majority of them who have had a long experience will admit that their instruction was very inadequate. I do not wish to minimize the work done by some of the post-graduate schools, but the study of orthodontia involves all the problems of life, growth, and development, as it is modified by heredity and environment and requires an enormous amount of study and an extensive practical experience to practice it successfully, and this can not be acquired in a few weeks.

OUR PROGRAM

I want to express my appreciation of the splendid work done by the Board of Censors. They have prepared for this meeting a most excellent program of papers, reports of cases, and clinics. The amount of labor entailed in preparation for a meeting of this kind, making all arrangements for the program and for all other details of the meeting can only be appreciated by those who have had similar experience. I sometimes feel that those who have nothing to do but sit and enjoy the benefits from such a program seldom realize how much they owe the Board of Censors. Every member of this organization should feel that it is his duty to cooperate for the betterment and the upbuilding of the society. We sometimes thoughtlessly criticize when certain features of a meeting do not come up to our expectations, forgetting that when we offer a criticism we should suggest the remedy.

DEATH OF DR. LAW

The members of the American Society of Orthodontists mourn the loss of our fellow member, Dr. William G. Law, who by his sterling character had endeared himself to all of us.

I extend to the officers and the Board of Censors for the coming year my best wishes and assurances of my loyal support.

DISCUSSION

Dr. J. Lowe Young, New York City.—Unfortunately neither of the gentlemen who were put down to formally open the discussion on Dr. Mershon's address are present. Therefore, I will ask Dr. Pullen if he will be good enough to open the discussion for us.

Dr. H. A. Pullen, Buffalo, N. Y.—Mr. Chairman, Members of the Society: I am afraid I am not well qualified on such short notice to discuss so many important subjects were brought up by our president. While he was reading I was thinking of a paper Dr. Young, which he read not long ago, and which was called "The Permanent Filling of the Temporary Teeth." I did not hear the paper but am sure it must have been a splendid one, and along the line in which we are all interested. I have no doubt it dealt with the very conditions we have to deal with every day where we find the deciduous teeth going all to pieces because the dentist lets them go to pieces. By the permanent filling of the temporary teeth they are prepared for the dental arches that are to follow. I hope Dr. Young will tell us something about what he had to say in that paper.

After teaching in a postgraduate school, I am fully convinced that a short-term school does not give enough practical or enough theoretical work to enable any one to start out as he ought to. I think a year's course, at least, should be given to a man who is looking for a course in orthodontia. The president said that many of our members had received only a short-term course in orthodontia. It is true that was all we had to begin with, but many of us have been working in a postgraduate course for twenty or twenty-five years or more, and do not feel that we have graduated yet. If it takes that long to feel that you are really getting started, surely they should have at least a year to give them a little start on their feet.

I feel, as I am sure we all do, the loss of Dr. Law and the other members who have died during the past year, and I am sure it is a very great loss to the American Society of Orthodontists. Dr. Law had planned to have an academy of orthodontia in New York City, and with him at the head of it I am sure it would have been a very good school. We have sustained a very great loss in the death of Dr. Law for that reason, if for no other, and we all know that he was a very lovable man in every respect.

I am sorry that on such short notice I can not give you any better discussion.

Dr. B. E. Lischer, St. Louis, Mo.—I do not feel qualified to discuss this very excellent address on a moment's notice, but the president has brought up the subject of dental education and hence I consent to make a few remarks.

At the annual meeting of the Association of Dental Faculties of American Universities, held in Detroit, in January, I had the honor of presenting a "Syllabus of a Course in Orthodontics for Undergraduates." I found this association is preparing a syllabus for every subject in the dental curriculum, and that the entire work is to be published. Since then, Drs. Mershon and Johnson have been asked to serve with me in the further preparation of the course on orthodontics. I believe that the publication of such a syllabus is a step in the right direction, and I sincerely hope that this society will lend assistance in a matter so important.

I believe that we should continue our committee on education and I would suggest that it cooperate with the association to which I referred. The dental faculties of our universities are wide awake to the fact that they must not only provide undergraduate instruction in orthodontics, but advanced training for those who would specialize. They realize that the training of the orthodontist is a question which can not be evaded much longer, that the specialist, as well as the public, suffers immeasurably by the continuance of his training in private schools, where "short cut" courses, based on the ideal of the mechanician, often predominate.

I recall now that in my presidential address before this society at our meeting in Chicago, June, 1913, I made similar reference to the subject of orthodontic education, and I am happy to note that events are shaping themselves in complete conformity with the ideals to which I then gave utterance.

Dr. V. E. Barnes, Cleveland, Ohio.—We have listened to the brief and beautiful address of our president, which was so to the point, and to me it was all commendable. I want to add just two things that I have jotted down in commendation.

Our orthodontic treatment should begin only after we are reasonably certain that the teeth are free from infection. Believing this for more than ten years, I have insisted that all teeth that could not be treated and made free from infection should be extracted. I have especially insisted upon this action in regard to the temporary teeth. The prem-

ture loss of temporary teeth does not cause anywhere near the amount of malocclusion credited to it. The real cause is underlying and the loss of the temporary teeth only aggravates or changes the form of malocclusion. The real loss following premature extraction of temporary teeth is loss of mastication surface, and the loss of some of our anchorage which we should like to use to mold bone so that permanent teeth may erupt to better positions.

I wish to commend the stand against dentists just out of college specializing immediately as orthodontists.

Dr. John V. Mershon, Philadelphia, (closing).—I can only add, in closing, that I appreciate the very kind and complimentary way in which my very brief address has been received. I have said in the address all that I had to say, and I thank you very much.

DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

M. N. Federspiel, D.D.S., M.D., F.A.C.S., Milwaukee.—Vilray P. Blair, M.D., F.A.C.S., St. Louis, Mo.—Arthur E. Smith, M.D., D.D.S., Chicago.—William Carr, A.M., M.D., D.D.S., New York.—R. Boyd Bogle, M.D., D.D.S., Nashville.—Major Joseph D. Eby, D.D.S., Atlanta.—Thos. P. Hinman, D.D.S., Atlanta.—Arthur Zentler, D.D.S., New York.—Leroy M. S. Miner, M.D., D.M.D., Boston.

COMPLEX COMPOSITE ODONTOMES—REPORT OF A CASE

BY M. N. FEDERSPIEL, D.D.S., M.D., F.A.C.S.

Professor of Oral Surgery, Dental School, Marquette University, Milwaukee, Wisconsin

COMPLEX composite odontomes may be defined as calcified tooth tumors of their substance a conglomeration of enamel, dentine, and cementum. These tumors are the outcome of misplaced embryonic cells, permitting a perversion of growth of a part or the whole of a tooth germ or germs.

These tumors vary in size from that of a pea to a mass the size of a hen's egg. The surface is usually rough in character with deeply pitted areas.

Complex composite odontomes are usually found in the molar region. During their growth they usually give no sign of any abnormal condition until they encroach upon nearby tissue, producing a sensation of fullness, tenderness, and radiating pain. On account of their growth being extremely slow, it may be years until the tumor is recognized. Occasionally this form of tumor makes its appearance through the gum tissue similar to an erupting tooth. If this happens infection may invade the area surrounding the mass and develop a well-defined fistula. In time the tumor may loosen and drop out or be shelled out of the diseased bed.

A striking example of such a condition is best illustrated in the following case:

Patient, Albert H., age ten years, school boy, American born, white, and weight 70 pounds.

Complaint.—Pus oozing from palatal surface of upper left second bicuspid.

History.—On December 24, 1917, upper left deciduous tooth was extracted. One month later patient began to complain of pain in the region of left antrum. The jaw began to swell in region of upper left first molar. This was lanced by his dentist, but pain continued sufficiently to confine patient to bed for two weeks. Pus began to flow from a fistula which developed at the area where the tissue was lanced. This condition continued until April, when he was referred

to me. The condition of his mouth as to cleanliness was fair. There was a slight gingivo-pericementitis on the lingual surface of lower left first molar.

$\frac{6,5,2,1}{6,2,1} \mid \frac{1,2}{1,2,4,5,6}$ erupted and in normal occlusion. The deciduous teeth remain-

ing were $\frac{d,c}{d,c} \mid \frac{c}{c}$. The upper left jaw revealed a large mass 2 inches long and

2 inches wide, the mucous membrane covering the area was congested, the center



Fig. 1.

of which had sloughed, exposing a bony mass about the size of a five cent coin. There were no evidences of the eruption of $\frac{5,6}{5,6}$. His tonsils were enlarged and showed diseased crypts. The nasal channels were normal.

The x-ray revealed a large mass extending in the antrum, see Fig. 1.

Probable Diagnosis.—Odontoma.

Patient was referred to hospital for operation.

Under ether anesthesia an incision was made over the mass about two inches

long. The mucoperiosteal flap was dissected free from its bony attachment. The outer bone plate, which was found to be somewhat diseased, was removed. The tumor was then shelled out of its bed (Fig. 2). The cavity was found to be diseased and foul smelling. The wound was swabbed with iodine and packed with iodoform gauze. Patient was put to bed in good condition.



Fig. 2.—A complex composite odontoma showing first permanent molar buried in tumor mass.

The packing was removed on the third day and after that the cavity was irrigated with boracic acid solution. On the eighth day the patient was discharged. He returned three months later for observation and the cavity was found to be closed.

MANDIBULAR BONE GRAFTS*

BY C. W. WALDRON, MAJOR C.A.M.C., AND E. F. RISDON, CAPTAIN C.A.M.C.

BONE transplantation in so far as the lower jaw is concerned is a surgical procedure of long standing, yet when one looks back upon the relative infrequency of this operation in civil practice, one realizes the unexampled opportunities afforded us by the large number of cases of war injuries of the mandible. During the past three years the surgeons doing this work have made a careful and uninterrupted study of all the various phases of the problems arising in cases of severe fractures of the lower jaw. Within a few days of being wounded most of these cases have come to a special jaw injury centre for treatment. We are all aware of the excellent results obtained by this policy of segregation, for the large percentage of cases attaining bony union and good function testify to the skillful splint treatment rendered by the dental surgeons specializing in this work. In those cases in which x-ray and clinical examinations would seem to show such an extensive bony loss that union could not reasonably be expected, we are strongly of the opinion that continued surgical supervision and close cooperation with the dental surgeon are of prime importance.

EARLY TREATMENT

Though not strictly within the scope of this paper, we feel that some of the more important points should be considered. In the early stages, persistent efforts should be made to keep the mouth as clean as possible by frequent mouth-washes and irrigation of pockets and sinuses. We are convinced that too much stress can not be laid upon the evil effects of curetting the fragments. Our policy has been to encourage free drainage of the sinuses present without disturbing the comminuted fragments, removing sequestra from time to time as they are found to be separated. The increasing number of very severely comminuted fractures resulting in bony union confirms our belief in the merits of such conservative treatment. Displacements of the fragments should be corrected by dental splints as early as possible and when there is a remote possibility of union taking place it is advisable to secure additional immobilization by the construction of a dental splint for the upper jaw, to which the splinted lower jaw, in correct occlusion, may be fixed, by means of an interlocking device. The prevention of displacement and the control of edentulous posterior fragments are of great importance in the early stages and in many cases may be most difficult. The usual methods employed are posterior extensions from the lower or the upper splints. Other methods of which we have had no experience, are the malar-coronoid screw fixation, described by Major H. P. Pickerill, N.Z.M.C., and that of Bruhn and Lindemann, who, by an external operation, expose the posterior fragment, to which a wire is fixed by means of washers and a nut. This wire is attached to the mandibular splint by means of a bar extension. It is usually not advisable to keep the mouth closed by splints for more than two months, for after

*Read at a meeting of the Section of Surgery, Royal Society of Medicine, held January 22, 1919. Reprinted from the British Journal of Dental Science, July 1, 1919.

that time the careful exercise of function seems to promote increased bone formation in those cases in which some degree of union may take place. When nonunion is obvious, the early use of the jaws is advantageous in that atrophy and extra-articular ankylosis are prevented. In many cases this is accomplished by the insertion of a small splint on one fragment with a flange extension which maintains correct occlusion yet allows free opening of the jaws. A careful examination of the teeth should be made, extracting such as are sources of infection and those that are too close to the lines of fracture, and preserving those that will be of service in the immobilization of the parts when the bone graft is performed. The latter point is of great importance, and every care should be taken in the early treatment to prevent undue strain upon the essential teeth. Careful examination should be made at regular intervals, to insure efficient drainage as long as external or alveolar sinuses are existent, and, to determine as accurately as possible, and record the date at which the external and alveolar sinuses have finally become healed.

WHEN TO OPERATE

Clinical and bacteriologic evidence has shown that operations should not be performed until at least six months have elapsed after the complete disappearance of all inflammatory phenomena. Further delay is of benefit in those cases in which the ununited fragments are strong, easily controlled, and fair powers of mastication may be obtained by means of dentures or splints. In the case of edentulous or short posterior fragments that are controlled with difficulty, bone grafting should be performed at the end of six months, in order to prevent atrophy, displacement or fixation of the free fragment. Without doubt some of the failures reported in the literature may be attributed to operating at too early a date.

THE TRANSPLANTATION OF BONE

The consensus of opinion appears to be that the transplanted bone has varying, but extremely important, osteogenetic properties. Gallie and Robertson have shown that this is due to the osteoblasts present on the periosteal and endosteal surfaces and in the open mouths of the Haversian canals, which are in position to absorb nutriment from the bathing lymph. As osteoblasts are more numerous on the endosteal surface, they recommend that grafts should include periosteal and endosteal surfaces. Albee,¹ for the same reason, advises a bone graft consisting of all its elements as it approaches more closely a complete physiologic unit—especially in reference to nutritional distribution—which is obviously an advantage. With regard to the osteoconductive property of transplanted bone, Gallie and Robertson state that the rapidity of absorption and replacement of the graft depends on its size, density, and the abundance of the supply of osteoblasts that survive on the surface, the replacement being slower in very thick grafts. With regard to the density of the graft, their experience is that replacement is very rapid in open cancellous bone, such as the rib, less rapid in grafts cut from the face of the tibia, and most retarded in densely compact bone, such as the crest of the tibia. The relative osteogenetic activity of the transplanted bone and of the fragments must vary with the individual case, and therefore the principles outlined should be applied surgically in such a way

that full advantage is taken of the osteogenetic properties of the fragments and transplanted bone, and of the osteoconductive properties of the latter. This will be discussed when describing technic of the operation.

We have not had any experience with osteoperiosteal grafts, but have seen many excellent results in the hands of our colleagues at the Queen's Hospital, Sidcup. This method is best suited to cases where the bony loss is slight, or where there is incomplete union. Neither have we used the pedicled graft which Mr. Percival Cole so strongly recommends, but we intend to use it before long. It might, with advantage, be combined with free iliac crest or tibial grafts or with osteoperiosteal grafts.

We have not had any experience in the use of boiled bone, having confined our work to the use of autogenous free grafts.

TYPES OF FRACTURES AND SPLINTS

These may be conveniently classified according to the relative difficulty in immobilizing one or both of the fragments. This is shown diagrammatically in Figs. 1, 2, and 3, showing the fracture and the general plan of immobilization by dental splints.

Even when specially constructed, dental splints are only capable of very limited modification at, or during the time of, operation. It is preferable, therefore, in most cases to fix the fragments in good position by means of strong dental splints not capable of adjustment, and to carry out the operative technic accordingly.

We have not used the open-bite splint, but expect to do so in the near future, in some cases with edentulous fragments.

The results obtained on this service are in a large measure due to the excellent services rendered by our dental colleagues, Captain B. Mendleson, attached R.A.M.C., and Captain A. H. L. Campbell, C.A.D.C.

THE OPERATION

Fixation of the Fragments.—The necessary dental splints should be cemented to the teeth at least one week before the operation, in order that the mucous membrane of the buccal cavity may become accustomed to them. We have found that frequently small ulcers occur, owing to small irregularities in the splints, the projection of the interlocking devices and the action of the free acid from the cement.

The Anesthetic.—Rectal oil ether anesthesia, supplemented when necessary by intrapharyngeal ether administered through a nasal tube, has been the method employed in eighteen of our cases. We have adopted this method as a routine in bone-grafting, as one most satisfactory in every way.

The Preparation of the Operative Field.—After a preliminary ether and tincture of iodine preparation of the skin, we fix a square piece of sterile dental rubber dam to the cheek and the lower lip, by means of adhesive plaster. By turning this upwards, the mouth is walled off from the overlying towels, which will be subsequently placed, and soiling or contamination of them by mucus or saliva is prevented. At the conclusion of the operation, the rubber dam is turned down, covering and protecting the dressings from the fluids of the mouth. The incision is made in accordance with the position of the bony defect, keeping in

mind the desirability of having the closure below the level of the graft rather than directly over it. The nontouch technic introduced by Sir Arbuthnot Lane is followed. As soon as the subcutaneous tissues are freely exposed, the skin surface is walled off from the wound. The ends of the fragments are exposed and the periosteum is elevated from their external, inferior, and internal surfaces for a distance of 1.5 to 2 cm. on each side of the hiatus. Great care must be taken, particularly on the internal surface, to avoid perforation into the mouth cavity. The height to which the separation may be carried safely may be determined by the previous examination of the mucous membrane over the ends of the fragments and reference to the x-ray plates.

Preparations of the Fragments.—The ends of the fragments should be trimmed back from 1 to 1.5 cm. or more, until bleeding, healthy bone is reached. Intervening cicatricial tissue should be excised and discarded. After some experience with electric bone-grafting instruments, circular saws, etc., used in attempting to shape the fragments and graft by the formation of steps, pegs and dovetailing, etc., with a view to obtaining autofixation of the graft, we have discarded these more complicated methods and instruments, in favor of the most simple. Since taking this step, our results have been better. We do not like the peg and hole fixation on account of the fact that the preparation of the hole in the fragments involves the reaming out of the endosteal tissues, which are of greatest osteogenetic importance. Accurate dovetailing and the formation of steps in the fragments of the lower jaw are quite difficult on account of the general contour and variations in the planes of the fragments. When one realizes that but little more than 1 cm. of the external surface of the jaw in the vertical direction may be exposed with safety, the difficulties in the manipulation of electrically driven saws in so small a space are readily appreciated. These methods usually involve the use of the tibia, and we have observed that in order to secure a good mechanical fit the endosteal surfaces of the grafts have been sacrificed. We therefore prepare the fragments by the use of rongeur forceps, our choice being a Friesner mastoid rongeur forceps and Lane's gouge forceps. We attempt to square off the ends as well as possible, and to leave a ledge above the graft which affords additional surface contact between the fragment and the graft. This is shown in Fig. 1a. This method puts a minimum of operative stress upon the interdental splints, precluding any possibility of displacing the fragments from the splints. In the case of gaps, situated anteriorly, a square or butt joint may not be readily obtained on account of the contour and planes of the two fragments. A satisfactory overlapping plane joint, can, however, usually be obtained without much difficulty. Similarly some special preparation with overlapping or notching may be found necessary in the case of free posterior fragments, which may, with advantage, be forced backwards and slightly downwards by the graft. When the bed for the graft is prepared, holes are drilled in the fragments through which two short lengths of Belgian iron wire are passed and held by clamps. Measurements are then taken for the graft.

THE GRAFT

In choosing bone for grafting purposes, we have been guided by the theory that the larger the area covered by osteoblasts in the Haversian canals into which the blood-vessels may project, the better, and the more cancellous the graft is

consistent with necessary strength, the more rapid will be the change from the transformed section of the transplant to the live bone forming bony union. We feel that the bone that fulfils the above requirements best is the iliac crest. The tibial crest, in our experience, has given good results, also the inner surface of the same bone, but according to the theory, the grafting is rather too compact when the tibial crest is used. Further, the patients may be incapacitated for some time, and fractures of the leg at a later date are by no means rare. The

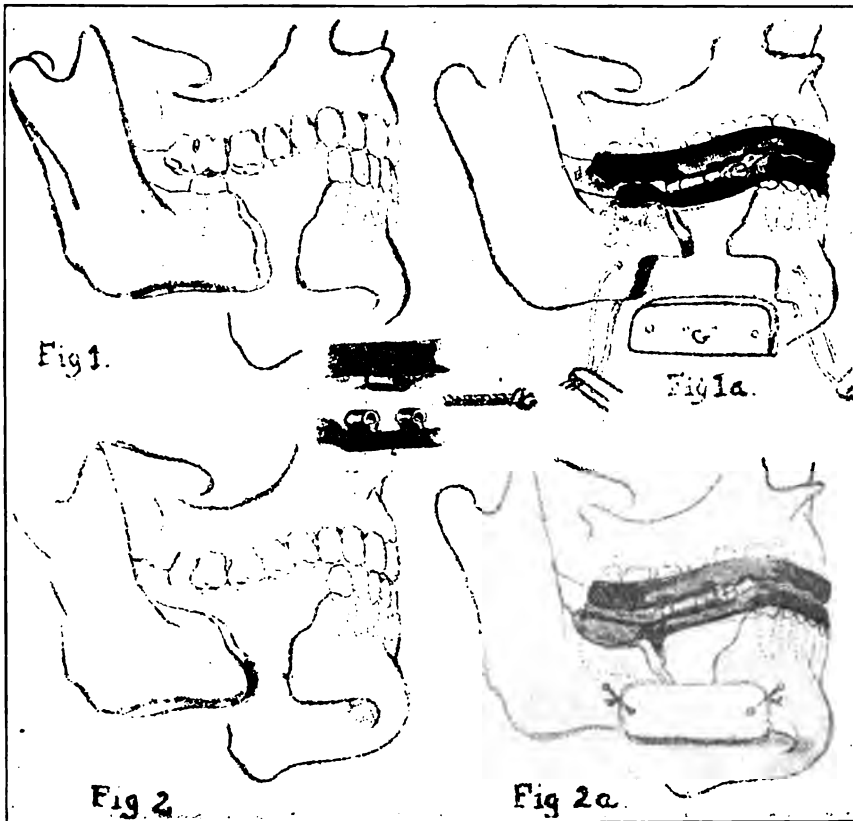


Fig. 1.—Nonunion right premolar region.

Fig. 1a.—Fixation of fragments by dental splints; preparation of fragments for graft "G."

Fig. 2.—Edentulous posterior fragment.

Fig. 2a.—Control of edentulous posterior fragment by dental splints; fixation of graft.

Inset.—Interlocking device.

rib, in our cases, was not a success, as it seemed to undergo an aseptic absorption, which resulted in a springy mandible, where the graft was long. In these cases, a considerable portion of the outer compact surfaces has been removed before inserting, to allow the fluids of its bed to permeate it. This has also been the reported experience of some German surgeons, and further, in many cases of other surgeons we have examined, where the rib was used, we have noted the same objection. The iliac crest graft is easily obtained, is very cancellous, strong, and particularly adaptable, as any surface may be used. The crest is easily exposed and the required amount removed by thin chisels and narrow

saws. Hemorrhage may be free, necessitating firm pressure and the insertion of a rubber-tube drainage. The graft is readily trimmed and fitted to place. Holes are then drilled in each end of the transplant, through which are threaded the wires previously inserted in the ends of the fragments. These are then tightened, fixing the graft firmly in position. The subcutaneous tissues are then united with interrupted mattress catgut sutures, and the skin closed with horse hair. It is important that all hemorrhage should be controlled before closure. Should any slight oozing persist a short drainage tube to the subcutaneous tissues may be left in position for twenty-four hours. The technic we have employed for incomplete alveolar union is similar, as shown in Fig. 4a. For incomplete basilar union, we have used the tibial inlay graft, as in Fig. 5a.

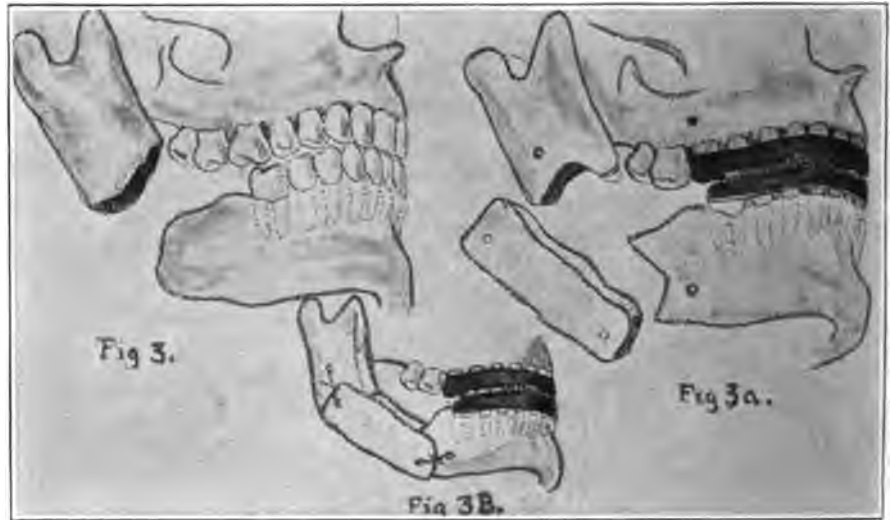


Fig. 3.—Nonunion region of angle—control of posterior fragment most difficult.
Fig. 3a.—Splint fixation of anterior fragment; preparation of fragments for graft.
Fig. 3b.—Posterior fragment wedged backward by graft.

POSTOPERATIVE COURSE—TREATMENT—COMPLICATIONS

The patients are kept on a fluid diet for a few days, after which ordinary minced diet may be ordered. It is advisable to keep the iliac crest cases in bed for a period of ten days or two weeks, in order to avoid the formation of hematomata which may become infected. In several of our cases slight infection occurred, which, under treatment, healed nicely without any ill effects. The facial incisions healed *per primam* in fifteen out of our twenty-three bone grafts of the lower jaw. In two, slight suppuration necessitated the removal of the wires, and the grafts were removed in four cases. The splints are left in position, keeping the mouth closed for two months. If both fragments are well controlled by the lower splint, the mouth may then be left open and function exercised carefully. If the posterior fragment is free, it seems advisable to keep the mouth closed for three or four months. During this period the splint-pins may be removed at intervals, and the mouth opened for examination. We have been removing the splints about four months after operation. In some of our

cases splints have been left on for a much longer period on account of the fact that the patients were away on extended furlough. The time of removal of the splints is more or less governed by the progress shown in the x-ray.

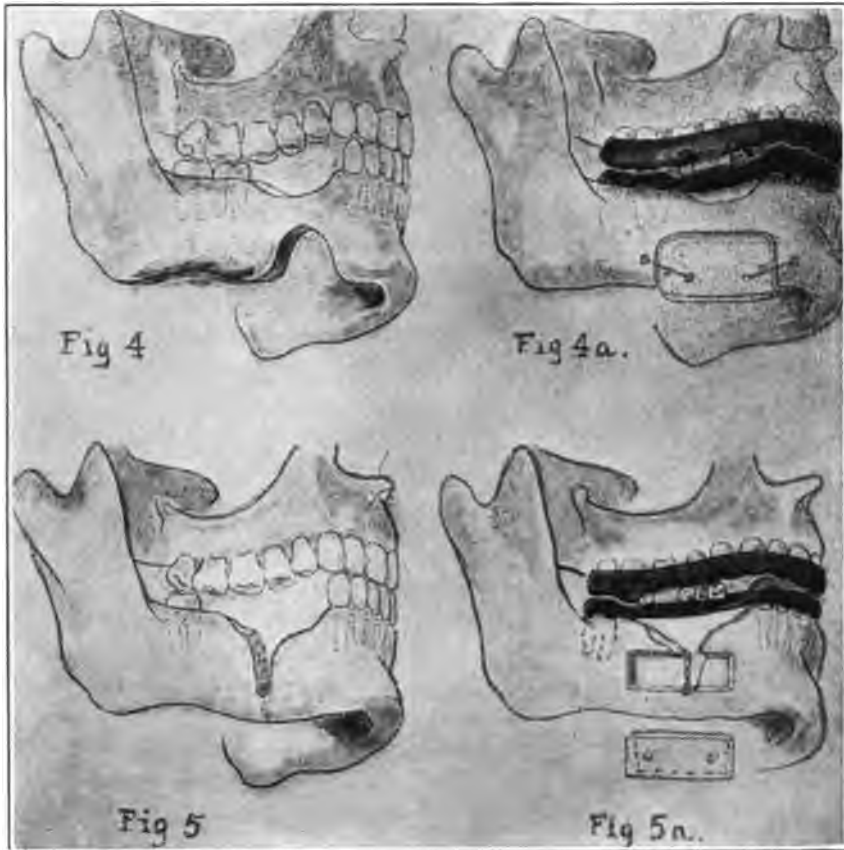


Fig. 4.—Incomplete union, alveolar; basilar defect.
 Fig. 4a.—Splint treatment and fixation of bone graft.
 Fig. 5.—Incomplete union, basilar.
 Fig. 5a.—Preparation for inlay bone graft.

RESUME OF CASES SHOWN

Ten patients were shown. Two had some degree of alveolar union, with slight but definite movement at the site of fracture, after a year or more of observation, and the operations were performed with the view of obtaining strong union. In one of them infection occurred, necessitating the removal of the tibial graft. A large amount of new bone was, however, laid down, resulting in strong bony union. The second was an iliac crest graft, in which strong bony union was obtained. In the remaining eight patients (nine grafts), separation of the fragments, varying from 0.5 cm. to 6 cm., was found at operation. Both fragments were well immobilized by the splints in three cases, and strong bony union, with good function, was obtained (one tibial and two iliac crest grafts). In one case the posterior fragment was displaced from the splint at the time of operation. An iliac crest graft with hole and peg fixation at one end was used. Union has progressed very slowly, but is finally becoming bony. The functional re-

sult is good. In one patient immobilization was most difficult and imperfect on account of the few remaining teeth being weak and the absence of upper teeth. The connective tissue bed for the graft was thin, containing considerable soft tissue. A bent, split rib-graft was used. Following the operation there was recurrence of a salivary fistula, accompanied by slight suppuration, necessitating removal of one of the wires. The parts are now well healed and the graft is in position. The result is in doubt. The posterior fragments were not controlled in three cases (four grafts). In one (iliac crest) the functional result is good, but strong manipulation reveals a definite spring between the graft and the anterior fragment. In the remaining two cases (one double-graft tibial and one iliac crest), union progressed very slowly, but finally complete bony consolidation took place.

CONCLUSIONS

1. Bone grafting of the lower jaw is an operative procedure, whereby union of the fracture and restoration of function may be expected in a large percentage of cases.
2. Complete cooperation and careful attention to every detail by the dentist, surgeon and the surgeon concerned are essential from the "early treatment" to the "final" stage.
3. Full advantage should be taken of the osteogenetic activity of the fragments, and of the transplanted bone, and also of the osteoconductive properties of the latter. The iliac crest is, in our experience, best suited in most cases for the bridging of defects in the lower jaw.
4. The operation should be made as simple as possible, the object being to obtain good contact of the graft to fresh, healthy bone of the fragments, maintaining the same firmly in position by wiring.

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- ²Gallie, W. E., and Robertson, D. E.: Transplantation of Bone, *Jour. Am. Med. Assn.*, 1919, lxx, p. 1134.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Ulcerative Lesions of the Mouth and Pharynx Due to the Vincent's Bacillus. David and Hegguet. La Presse Medicale, 1920, No. 6, p. 54.

An aftermath of the war in Roumania is represented by bucco-pharyngeal lesions having a peridental, buccal and tonsillar localization, usually developing insidiously without serious impairment of the general health, without causing glandular enlargement or a rise of temperature. On examination, the microscope invariably revealed in these lesions the presence of the fusiform Vincent bacillus with its spirillum. Prior to the war the characteristic lesions of Vincent's angina were rather uncommon, but since a year or longer, this disease which began in Roumania is also observed among the soldiers of French regiments. One of the authors has insisted for a long time past on treating all ulcerations of the mouth, including cancer, with glycerine solutions of arsenobenzol, the results proving very favorable. These solutions relieve the pain, even in cancer cases, and remove the offensiveness of all buccal wounds and ulcers; suggesting that the spirilla which have their normal habitat in the mouth play an important part in all secondary infections of the buccal cavity. The treatment of buccal spirillitis with arsenic is generally recommended, and in the authors' personal opinion, intravenous arsenobenzol medication is less efficient than local treatment. Whenever practicable, they apply the combined treatment, namely, arsenic in the vein and on the wound; where this is not feasible, they limit themselves to 1 local treatment with arsenic. The wound is first cleansed with a silver nitrate solution (1:10), which mildly cauterizes the surface. After this, the ulceration and bleeding surface is painted with a solution of arsenobenzol, 90 centigr. per 30 gr. of glycerine. Presumably this solution is altered on contact with the air, but no untoward effects were observed to follow the employment of solutions which were about a fortnight old. The first effect of this treatment is the disappearance of the pain in chewing and swallowing; the wound then becomes clean, and the false membrane which covers it increases in strength. When this is removed from the buccal mucosa in the course of treatment, at the end of a few days, the wound is seen to be protuberant instead of depressed, projecting above the surrounding mucosa. Instead of a deep ulceration, solid granulations are present and the process of repair is under way. Gradually, the buccal mucosa forms a cicatrix which corresponds to the interdental line. The intravenous in-

jections of arsenobenzol are administered every six days, beginning with 3 centigr. and adding 15 centigr. at each injection. As a rule, the patients are placed on a milk diet and are given a prescription of sodium bicarbonate gargle 5 per cent. As soon as swallowing has ceased to be painful, the ordinary diet is resumed. Under this mode of treatment, the disease is generally cured in from twelve to twenty days.

Zone Therapy. E. F. Bowers. *Medical Review of Reviews*, 1919, xxv, No. 11, p. 673.

Based upon favorable experience in several illustrative cases, the author advocates that zone therapy be given a trial after other means have been exhausted. He describes a remarkable experience with a case of sciatica due to an impacted third molar, in which zone therapy cleared up a diagnosis that it had not previously been possible to render. The patient was a woman about forty-five years of age, who had suffered from sciatica of the right side for three months, finding relief only through the use of morphine. She was unable to move in bed without excruciating pain in the right hip and leg. The teeth on examination were found to be in very good condition, and the right molars, in particular, were all sound. But it was noticed that the lower right third molar—the wisdom tooth—which is in the same “zone” as the sciatic nerve, was impacted, the anterior cusp being caught on the distal aspect of the second molar, and the posterior cusp having projected above the gum to its normal position. The roots of the third molar were thus forced backwards and exerted a constant pressure in the “zone,” which found its expression in the perennially ready sciatic nerve. Extraction was decided on, and in order to produce anesthesia, pressure was used upon the fingers first, and later directly upon the inferior dental nerve. After three or four minutes, the tooth was removed without causing the slightest sensation of pain to this highly nervous patient who all the time had been calling for a general anesthetic. When she turned on her side to expectorate, she was amazed to find that there was now no pain in her leg, nor did it recur, and three days later she was discharged from the hospital, cured. This was four years ago, and there had been no more sciatica in her case, so far as could be learned up to the time of the report.

Alopecia Following Injuries of the Jaws. Bettmann. *Dermatologische Wochenschrift*, 1919, No. 3.

Alopecia of the face appeared exactly twenty-three days, and alopecia of the occiput exactly twenty-two days after x-ray transillumination on account of a slight right-sided gunshot injury of the mandible. The loss of hair was limited to the right side. At the first transillumination, the tube had been adjusted to the right cheek; at the second, to the right side of the occiput. The explanation of the occipital alopecia, as suggested by Jaquet, to the effect that the loss of hair is usually induced by an irritant derived from the teeth or their immediate surroundings and acting by way of the nervous conduction, does not fit this case, for the alopecia did not occupy the trigeminal territory, and an injury through the x-rays seems to be responsible.

The Pathology of Glossitis. Levinstein. *Centralblatt für Chirurgie*, 1919, xlv, No. 13, p. 34.

The author's observation is characterized by the fact that the affection was not restricted to the tongue alone, although it first appeared and was predominantly localized in this region, but also involved the mucosa of the lips, cheeks, gums, palate, and uvula. Symptoms on the part of the tongue preponderate in these cases, in the form of severe pains which become aggravated or subside according to the exacerbations and remissions of the disease. In the presence of severe pain, the ingestion of food is seriously interfered with, the result in protracted cases being a considerable loss of weight. Treatment in the form of local applications and gargling proved inefficient.

Epidemic Gingivitis. S. Lieben. *Wiener klinische Wochenschrift*, 1919, No. 2.

In the early part of the winter of 1916, the author observed a number of cases of gingivitis, which according to the mode of onset and the similar pathologic symptoms as well as the clinical course, showed an epidemic character and were distinguished by the long duration and the obstinacy of the phenomena. Treatment with hydrogen peroxide, 3 per cent, proved most desirable, the solution being injected into the individual germ pockets by means of a syringe with a blunt cannula in order to accomplish a mechanical removal of the pus.

Unusual Features of Infectious Diseases in the Eastern Theatre of the War. G. Loeffler. *Fortschritte der Medizin*, 1919, No. 4.

Inflammatory swelling and reddening of the mucous membrane of the jaws and cheeks, without hemorrhage, were frequently noted by the author in cases of recurrent fever. Also in typhus exanthematicus, buccal infections often occurred in Roumanians referable to defective hygiene of the mouth, and not infrequently resulting in inflammation of the parotid gland. In three instances (two cases of recurrent fever, and one case of typhus exanthematicus) this complication led to death, as sepsis could not be prevented in spite of deep incisions.

Oral Septics and the General Practitioner. R. S. Pennycuik. *Australian Journal of Dentistry*, 1919, xxiii, No. 11, p. 367.

Septic conditions in the mouth may give rise to the following local effects: Stomatitis and gingivitis of every degree, inflammatory pustular, sloughing, or gangrenous. Periostitis and otitis, alveolar necrosis, tonsillitis, pharyngitis, otitis, and sinusitis. Enlarged lymph glands. Postpharyngeal abscess. Meningitis. In these local conditions the chain of events is generally easily traced, namely oral septic followed by pharyngitis and infection spreading by way of the Eustachian tube to the ear, or again infection of the maxillary antrum followed by general infection of the paranasal sinuses, or antrum infection extending to the orbit and septic meningitis. A point of importance is the association of mouth breathing with oral septic. This occurs in patients who through nasal stenosis or other causes, are habitual or intermittent mouth breathers. In such

cases attention to oral cleanliness is vital, in order to lessen the susceptibility to infection. A septic mouth means a continuous onslaught of bacteria and their products on the tonsils, until their resistance is considerably impaired, with consequently increased risk of infection. At times in adults, but perhaps more often in children, one finds what is practically a chronic toxemia associated with a septic mouth, a general feeling of ill health, malnutrition, lack of energy, sallow and unhealthy appearance, a history of gastrointestinal disturbance. This in many cases is due to absorption of toxic products of micro-organisms and also to absorption of toxins produced from abnormal digestive processes. The sepsis produced by gold fillings, gold caps, gold bridges, gold crown, and especially by fixed dentures built in, on, and around diseased teeth, is particularly severe and harmful in its insidious septic effects, and great responsibility is attached to the performance of crown, bridge, and plate work.

Comparative Pathology of Influenza. S. Korach. *Berliner klinische Wochenschrift*, 1919, No. 10.

The localization of influenza on the buccal mucosa manifests itself by streaky reddening of the inner margin of the anterior palatine arch, tapering off towards the floor of the tongue, and radiating in fan-shape towards the uvula. The severe pains in the throat complained of by patients suffering from influenza-angina are possibly referable to these changes. Diagnostic importance is attached to the so-called influenza-tongue, consisting in redness and swelling of the papillae in the anterior third of the tongue.

The Tongue in Influenza. Stolte. *Berliner klinische Wochenschrift*, 1919, No. 6, p. 142.

The author repeatedly observed a pronounced reddening of the tip of the tongue, or a marginal glossitis, together with mild edematous swelling and redness of the pharyngeal ring, involving only portions of the soft palate and the uppermost segment of the epiglottis. In other cases, there existed a dry coryza and mild pharyngeal catarrh, not infrequently, small light vesicles were demonstrated on the soft palate.

The Practical Use of the Dental Radiograph. Sterling V. Mead. *The Dental Cosmos*, 1919, lxi, No. 10, p. 965.

The teeth as foci of infection. The author is very enthusiastic regarding the practical usefulness of the radiograph when used in the right way. He is thoroughly convinced of the fact that the teeth are the source of a great deal of systemic disturbances, and he thinks it is the duty of every dentist to regard the patient's general health as more essential than any restoration. The loss of the teeth can not be compared with the loss of a life. But the fact must not be lost sight of that apical infections of the teeth are not the only foci of infection in the mouth. Periodontal infection, or pyorrhea alveolaris, undoubtedly causes systemic trouble, and is itself associated with systemic disorders. Swelling and infection in the region of the submaxillary gland is due to the teeth in most cases and may come from either the upper or lower teeth. Where patients are e-

deavoring to locate a focus of general infection it is not enough in every case to simply make an ocular examination and give a positive statement that there is no trouble as there are many cases where it is impossible to determine whether or not there is infection without a pulp tester or an x-ray picture in case the tooth is devitalized. Most cases of systemic disorders seem to come from comparatively small radiolucent areas. This may be due to the fact that the most virulent of the pyogenes group of bacteria have a tendency to infiltrate to other parts, and those of less virulence tend to become localized.

Concerning the interpretation of radiographs, the author emphasizes that it is very unwise for anyone to undertake to interpret any film without having a knowledge of the case, and the radiograph should only be used as an aid to supplement the clinical observation of the operator. If there is infection upon a tooth, it is usually very easy to determine, if the picture is perfect. Cases where one is unable to determine whether or not there is infection are exceptions rather than the rule.

Anatomical Demonstration of Atavistic Origin of Fifth Cusp. M. Baudouin. *Bulletin de l'Academie de medicine, Paris*, 1919, lxxxi, p. 402.

The so-called Carabelli tubercle, which has been interpreted by some investigators as a pathologic lesion, the result of constitutional disease, notably syphilis, was shown by the author's findings on prehistoric upper jaw bones to be an atrophied dental cusp, the anterointernal cusp of the first large upper molar, about to disappear in the neolithic age. In the present epoch, this "tubercle" when present, therefore, constitutes simply a recurrence of an atavistic arrangement, which still existed in 50 per cent of the cases of dolichocephalic individuals of small stature, thousands of years ago. It is merely an accidental recurrence, an anatomic survival, indicating an ancestral condition which at one time was normal in dental phylogenesis. Accordingly, it can not be a pathologic lesion due to syphilis or any other faulty diathesis. The largest and most typical tubercles are seen in the teeth of the youngest children (three to ten years of age) in the author's prehistoric material. In proportion as the tooth increases in age, irrespective of its being worn by use, the tubercle seems to become somewhat atrophied, while the rest of the crown does not change in size since the formation of the dentin covering in the alveolus. The obvious conclusion is that Carabelli's tubercle can not be pathologic, for all affections of congenital character tend to become more accentuated during the growth of the child; and that it can only be of atavistic origin.

The X-ray Movie. American Red Cross News Service.

Combining in a single apparatus the moving picture camera and the x-ray machine, two French scientists, Drs. Lormon and Comandon, have worked out a "radiocinematograph" which makes possible movies of the interior functioning of living organisms. Although not yet entirely perfected, the new invention has reached the practicable stage, and it opens up new fields of investigation which radiology will not be slow to enter.

Medical experts attached to the American Red Cross Commission to Europe

are already considering its application to special problems raised by the unprecedented epidemics now sweeping central and eastern Europe.

Discussing the invention, Dr. Lormon states that the greatest difficulty encountered was the danger of thermic infiltration by the ultra-violet rays during the photographing of the subjects. To overcome this difficulty the inventor devised a method for changing the character of the rays employed, an achievement comparable to the original discovery of the roentgen ray.

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EDITORIALS

Dental Nomenclature

FOR a number of years, the American Institute of Dental Teachers has had a Committee on Nomenclature that has made attempts to standardize and modernize dental terms and has succeeded to a certain extent. The American Society of Orthodontists has a similar committee and it has made some suggestions and considered several terms in the last few years. Nevertheless there seems to be a great need for the standardizing of dental terms, not only in regard to dentistry itself, but also terms should be adopted for use in dentistry that have the same meaning in collateral sciences.

We recognize that dentistry, separated as it was in the beginning from medicine and the other allied sciences, unfortunately adopted a few terms which are used in no other branch of science with a similar meaning. It also seems that when the attention of the dental profession is called to the use of these improper terms, there is a tendency among some men to continue the use of the "outlaw names," regardless of the fact that dentistry is the only profession using them.

So far as the mechanical side of dentistry is concerned, we recognize that any special mechanical procedure may call into use certain distinct terms in order to describe some definite thing. The use of special terms became necessary with the development of the automobile and the aeroplane; such necessities may have arisen to a certain extent in mechanical and operative dentistry. However, there is one department of dentistry which unfortunately has adopted terms and used certain names which have various incorrect meanings. Those terms which are most often used incorrectly and improperly are the ones which, above all, have no definite and scientific meaning and do not have a definite meaning in other branches of science; this makes it appear all the more ridiculous for the dentists to continue to use terms which are not recognized by men in allied professions. We refer particularly to terms used in anatomy, especially dental anatomy.

Dentists have for a long time spoken about the "articulation of teeth" which they have referred to the relation which the teeth of one arch bear to the other. Arguments have been waged long and hard as to the distinction between occlusion and articulation, some men claiming occlusion was the relation of the inclined planes of the teeth when the jaws are closed, others claiming articulation was the relation of the inclined planes of the teeth during mastication. As a matter of fact, of all the various scientific societies that consider anatomic subjects, dentists have been the only group that have adopted the term articulation as having any meaning whatsoever in regard to the relation of the teeth in one arch to the other. In all other anatomic societies, the word articulation has a definite meaning in regard to the manner in which one bone functions or approximates with another. For a number of years, comparative anatomists in speaking of the relation of the lower teeth to the upper, used the term "mutual antagonism" which was not exactly satisfactory, but at least distinguished some particular thing, and did not confuse two anatomic conditions with each other. Later some of the foremost comparative anatomists adopted the term "occlusion" as being appropriate in describing the same thing they formerly understood as "mutual antagonism," and the term occlusion covers everything that was embraced by the incorrect use of "articulation." Nevertheless, we find a number of dental educators still insisting upon the use of the word "articulation" as describing the relation of teeth of one arch to the other. This is an incorrect and obsolete term, and is not recognized by any other group of men.

A few years ago, some of the early dental writers, in describing human teeth, adopted the terms "bicuspid and cuspid" as being the names for certain teeth in the dental arch. The "cuspid" in the human series is supposed to be the third tooth from the median line, while "bicuspid" was applied to the fourth and fifth teeth from the median line. These names were based upon the shape of the tooth, in that the third tooth from the median line was a single cusped tooth and was therefore called a cuspid, while in the upper arch the fourth and fifth teeth having two cusps were called bicuspids. The early dental writers using that faulty nomenclature and classification were not recognized by any of the other anatomic societies. The names of these teeth based upon their shape is more or less correct so far as the teeth in the maxillary arch are concerned. Of the mandibular teeth, we find the third tooth from the median line is also a single cusped tooth.

but when we approach the fourth and fifth teeth, we find the nomenclature based upon the shape of the teeth becomes very often a decided misnomer. While the fourth tooth from the median line in the mandibular arch may possibly be termed a two cusp tooth, we find it has a decided tendency to be a single cusp tooth, the second cusp being nothing more than a cingulum. When we approach the fifth tooth from the median line of the mandibular teeth, we find this tooth may be two cusped, but in a great many cases it presents three cusps, which proves the plan of nomenclature based upon the shape of the teeth becomes decidedly wrong. Of late years more scientific dental writers have insisted on calling the third tooth from the median line the canine, based upon its shape, evolution and anatomic characteristics, and the fourth and fifth teeth from the median line they have called premolars. The terms canine and premolars have long been used by the European writers, and have also been used by all other scientific anatomic societies except dentists. The writings of A. Hopewell Smith and M. N. Cryer contain the words canine and premolar in preference to cuspid and bicuspid.

The reasons given by some of the American dentists for not adopting the terms canine and premolar, are very unscientific, and in some instances are almost amusing. These men have opposed the adoption of the correct terms simply because they have learned to use the term cuspid and bicuspid and for that reason they are opposed to any progress in the science. We find the extreme to which some of the dental educators go in persisting in the use of these obsolete and incorrect terms is almost ridiculous. Recently in one department of one of the university dental schools, the head of the department, being a young man of more modern scientific education, was using the terms canine and premolar in his department, based upon his exact knowledge of dental anatomy obtained not only in dentistry but in other sciences. He was informed by the dean of this progressive (?) university dental school that the terms canine and premolar were not to be used, because Dr. Black years ago used the terms "cuspid," and "bicuspid" and as they were using his *Operative Dentistry*, those were the terms which were to be used. We are willing to give Dr. Black credit for a great many things he did in dentistry, but we very seriously doubt if he himself were alive that he would be willing to shoulder the responsibility for causing the dental profession to use such incorrect terms as "cuspid" and "bicuspid."

Another lesson which can be drawn from the example which we have cited in regard to the use of obsolete terms is the fact that here we have a university dental school which is supposed to be a leader of dental education, setting up the example and continuing the use of terms which are unscientific and not used by any other scientific men except dentists. It would be much better if such institutions would not claim to lead in dental education until they were willing to drop obsolete ideas and hobbies because the dean was accustomed to use those terms when he went to school.

Unfortunately, the orthodontists have become accustomed to use certain terms, which they have adopted from dental anatomy as written by dentists, which anatomically have an incorrect meaning. We refer particularly to the use of the terms "mesial" and "distal" as describing surfaces of the teeth; they are incorrectly used from an anatomic standpoint. This was called to the attention of the profession by Dr. A. Hopewell Smith several years ago. We realize that

they have become so firmly anchored in the dental profession as describing the surfaces of the teeth that it will be very difficult to get other and more accurate terms adopted to be used in their place for some time. These terms as used in the description of the surfaces of the teeth are inaccurate and incorrect when used in the description of "arch relation." For example, considering anatomic descriptions of the human body, we find the distal surface of a part is that portion farthest removed from the median line. For instance, describing the ulna and radius, we find the distal ends of these bones articulate with the bones of the wrist, which would be that portion farthest removed from the median line of the body. Therefore in describing a dental arch, which is in distal occlusion, orthodontists have adopted that term to mean that the lower teeth occupy a posterior relation to the upper teeth, which would necessarily mean that in "distocclusion" cases, the lower teeth were nearer the median line of the body than they would be in "mesiocclusion." Owing to this anatomic error in use of terms we believe it would be a better plan in speaking of distocclusion cases to more accurately describe them by speaking of a "posterior relation of the mandibular teeth," which would be anatomically correct, and also "anterior relation of the mandibular teeth" instead of using the term "mesiocclusion." In reality, from an anatomic consideration a mesial relation of the lower arch is really an anatomic "distal" position of those teeth in regard to the median line of the body, in the same manner that the hand is on the distal end of the arm. However, in order that the terms may not be used with two meanings, a number of men who have given this matter study, are using the terms "anterior relation of the mandibular teeth" and "posterior relation of the mandibular teeth" as being more descriptive and more anatomically correct than the terms which have been adopted.

We believe that any one who is interested in the advances of dental nomenclature, should accept scientific terms that are brought to their attention and not try to block the wheels of progress, as some of the older educators from universities are doing, by basing their arguments on the facts that they learned certain terms and are not going to learn any others or allow any others to be taught in their schools. If dentistry is to be a science along with other allied branches of science, it can not have a separate nomenclature and language of its own, or it will continue to exist by itself as it has in times past.

Federspiel's Dental Clinic

"BEGINNING May first, nineteen hundred and twenty, Drs. Federspiel, Rohde, Morgan and Berry will conduct their practices under the name of Federspiel's Dental Polyclinic."

This announcement is rather unique in the dental profession, and marks what is probably the first formation of a dental unit composed of a number of men, each one of whom has specialized in some particular line of dentistry. We know that in other towns, men have combined their efforts, and under a partnership basis have conducted a dental practice. In some cases, this arrangement has been satisfactory; and where it has failed, it has not been so much the fault of the arrangement, as it has been that the men who had made up this dental unit

have possessed personalities that would not blend. From the standpoint of the public, we are inclined to believe the formation of dental units, or the conduct of a dental practice, the same as the Federspiel Dental Polyclinic is to be conducted, offers many advantages over the single practitioner of dentistry that has been common in times past. The advantage of "hospital diagnosis" in medicine over a common office diagnosis is that a number of men skilled in different lines pass upon the patient, each one from his own standpoint, and each one also considering the knowledge and information that the other one has gained. When knowledge from these various specialties is brought together and is made to coincide, the patient will undoubtedly receive better service than when the practitioner leaves the case to his own judgment. From the public standpoint, such a plan as Drs. Federspiel, Rohde, Morgan and Berry are attempting to work out possesses many advantages.

We realize the greatest difficulty is going to come from the profession because in almost every instance where a number of dental men have combined in a single office, we have heard the expression the "department store office" used by their competitors in a sort of a depraving manner. When we go a step further, as these men have done in the formation of Federspiel's Dental Polyclinic, we are afraid a number of the profession, especially in competition to the enterprise, will speak disrespectfully of the combination and even attribute it to nearing an "advertising office," owing to the fact that it is the intention of the Federspiel's Dental Polyclinic to take care of a certain amount of charity work in order that they may fulfill their greatest usefulness to the public.

However, the success of this remains to be seen, and we are inclined to believe, from the standpoint of the public, a group organization can render better service to the laity than they can render by working individually, each man for himself. We also believe that it will only be a comparatively short time until more dental groups will be formed; which eventually will closely approach hospital practice in medicine, with the result that several men working together, each man skilled in his particular specialty, will be able to render better dental service to the public than the individual working alone.

The success of the Federspiel's Dental Polyclinic, both from a professional and lay standpoint, will be watched with a great deal of interest, and we believe marks a step forward in giving the best service to the greatest number.

"The Golden Rule in Orthodontics"

"DO UNTO others as you would that they should do unto you," is not only axiomatic, but a religion that, if consistently followed, affords but little basis for criticism.

Why would this time-honored Golden Rule not be a beautiful precept to be strictly adhered to in referring an orthodontic case, under treatment, to an orthodontist in some other city or remote part of the country?

Who is there of experience in the treatment of orthodontic cases, who has not many times experienced delicate situations in which diplomacy of the most expert variety was required to prevent controversies and misunderstandings.

All this is a result of the operator having been referred a case of malocclusion under treatment, at the same time being furnished no previous history whatsoever, no records, casts or photographs of his case.

To glean this necessary information entirely, such as one can from the patient, is not only unfair to the new operator who takes charge, but the operator is almost invariably misquoted, his statements garbled, which automatically creates a lack of understanding between the two men.

If an orthodontist, to be properly trained, is expected to spend two weeks of his special course to prepare himself to properly complete scientifically made plaster casts as a record of his case, if he, when in practice takes pride in the most exhaustive and complete paper records, even to the dates of fitting individual bands on the teeth, if he takes his original photographs as a unit for case records, if all this is of prime necessity (and that it is necessary has never been successfully contradicted), then it is, to say the least, no more than common courtesy to send these records in detail, together with any and all other information which may have a bearing on the case to be continued, on to the new operator who is expected to complete the case.

There are certain resort cities in this country in which these referred casts rather than being desirable to the practices of the orthodontists located in these cities, become no small burden to the busy man. He should be given all information possible in regard to the history of such cases, including financial arrangements and anything which might have a bearing on his treatment which might aid him in his handling of the case. It has been contended, by some practitioners, that the matter of the financial transaction as it existed between the operator who started the case and his patient is of no concern to the man to whom the case has been referred; inasmuch as the second operator knows what his own time is worth and his fees for completing the work should be arranged accordingly; furthermore, that it is purely a private matter between the operator and his patient. This would appear logical in theory but in practice does not work out for the best interests of all three persons concerned in the transaction.

To adhere to this latter basis ultimately means that the patient usually receives as vigorous a shock from the second operator as was received from the first, for the reason that every man of experience knows it is worth more to finish a case than it is to start it. Notwithstanding this, the fact is patent that the exact point at which a case is "finished" might be a point of no small amount of contention between two of the most skillful operators. This all reminds me of the story told by a brother dentist in a recent discussion of orthodontics in general. He said, "The work of the orthodontists is most commendable and their results are beautiful, however, these results sometimes remind me of the little boy, who on Christmas morning, looking into his stocking found an old rope which obviously had been used for tying a horse. The boy, in his great enthusiasm and excitement of the occasion exclaimed, 'I got a pony but he got away.' The point, then, is the second operator must assume the responsibility that the 'pony does not get away.'"

It is said in the army that the earmark of an experienced officer is the ability to successfully "pass the buck" to his subordinate, then in orthodontics when

"pass the buck," it can just as well be passed with a goodly portion of the Golden Rule mixed in, which will save many misunderstandings, also save the orthodontist from the reflection cast by being misquoted by his patient, who usually does so, but not always intentionally.

It is to be remembered that at best the second operator is usually employed as a compromise, he being only a by-product of the patients' having changed their place of residence and his services should be ushered into the case with all available history and data of the case. It has been said by some men of wide and vast experience that "it requires a better orthodontist to finish a case than it does to start one."

Then there is the type that is so well known, that can be recognized by the familiar "Dr. X—— said that the case was practically finished but to have you look at it once in a while." Dr. X—— might just as well have said, "You go to Dr. Y—— and tell him to look at you, then when my work starts to collapse, go back to Dr. Y—— and have him treat you again and tell him not to charge you anything for it." A courteous letter should be sent from Dr. X—— to Dr. Y—— including a complete history, and Dr. Y—— will, nine times out of ten, leave no stone unturned to complete the case and bring it to a successful termination.

There is still another type of referred case. The patient has changed his place of residence, and has been referred to no man in particular, but has been admonished to consult no orthodontist in regard to the case until he has been satisfied that the eminent doctor uses only the famous "Plymouth Rock" wire appliance in his work. These patients, as a result of such advice, usually indicate a decided preference for either the Buick type of treatment or the Dodge, and seem to be well advised that the Buick type can be expected to be much more expensive.

There is surely a place for the Golden Rule in the referring of orthodontic cases.

ORTHODONTIC NEWS AND NOTES

The editors desire to make this department a permanent feature of the Journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

Notes of Interest

Beginning May 1, 1920, Drs. Federspiel, Rohde, Morgan and Berry will conduct their practices under the name of "Federspiel's Dental Polyclinic," 424 Wells Building, Milwaukee, Wis.

Dr. A. W. McClelland announces that he has moved his office from Biltmore Building to suite 606 Drummond Building, Montreal, Canada. Practice limited to orthodontia.

Dr. H. C. Metz announces the removal of his office from the Jenkins Arcade to 1201-1203 Hiland Building, Pittsburgh, Pa. Practice limited to orthodontia.

Mr. and Mrs. Robert H. Taylor announce the marriage of their daughter Florence Grace, to Dr. Harry Wellington Wilson, on Tuesday, May 4, 1920, Denver, Colorado.

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ORIGINAL ARTICLES

CHILD PSYCHOLOGY AND ITS RELATION TO ORTHODONTIC PRACTICE*

BY GEORGE F. BURKE, D.D.S., DETROIT, MICH.

THE entire civilized world is taking a greater interest in the study of child life, and this country is leading in this movement. By careful study in the school room and in laboratories equipped for child study, scientific men are developing methods by which it is possible to measure the intelligence of a child and train him in a manner best adapted to his special needs. The parent or teacher who fails to keep in touch with the results of these methods of child study and education will soon be as far behind the times as the farmer who plants his crops according to the phases of the moon, or the community who believes its typhoid epidemic is due to Divine wrath.

Not so many years ago the farmer who found musk-rat houses well protected and his corn husks extra thick, prepared for a "hard winter." If a crop failed he would lay the blame on the planets. But today, instead of planting by the moon, he consults the weather reports. When a crop fails, he knows that the seed was bad, that the soil was deficient in nutrition, his method of cultivation was at fault, or the weather was not favorable. During the past two decades the farmer in most parts of the country proceeds more along scientific lines. He knows that his crops are not at the mercy of unseen beings. Rather they grow by laws acting in a natural way. Instead of paying so much attention to studying the almanac, he has set to work to find out the natural laws governing his farming operations and then he directs his activities according to these laws.

Orthodontists spend their lives dealing largely with children, and it would seem that some time spent in the study of this subject should be for the benefit

*Read before the Alumni Society of the Dewey School of Orthodontia, Chicago, Ill., April 1, 2, and 3, 1920.

of both patient and operator. It is necessary for us to get on with our patients during varying periods—from just a few months in some cases to several years in others. Where the period of treatment is long and the spirit to cooperate on the part of the patient is not what it should be, we have a condition that is conducive to the best results. So the purpose of this paper is merely to introduce more interest into this subject, which is so much worth while.

Successful men in the business and professional world, also those in public life, know much of the psychology of the crowd. This is splendidly illustrated by statesmen when addressing audiences making use of such terms as "My friends," or "My fellow-countrymen." Strange it is that some very brilliant and able men are lacking in a knowledge of mass psychology. Lincoln and Roosevelt understood it well, and so do Billy Sunday and Harry Lauder.

Billy Sunday has the crowd well in mind when he has his janitor tie a pink ribbon on the back of a kitchen chair and has it placed up back of his head in one of his made-to-order auditoriums. He knows that thousands of men and women will look up from his great audience and say "Why that is the same kind of a chair we have in our kitchen at home. His methods are interesting."

So it was with Roosevelt on his campaign trips in wearing a big broad-brimmed hat. He knew that many farmers, cowboys and Indians wore them and he knew that they would like their great leader all the more because he was wearing a hat similar to their own. Their hats gave them something in common, and where people have even one thing in common, getting acquainted is made easier.

Your audiences are much smaller than those of either Roosevelt or Sunday. In fact many times they consist only of a mother and child. You will not care to use either a kitchen chair or a large hat to interest them, in all probability. But you may have at your command a story, a doll, a watch fob, buttons, or keys, a good picture—in fact, something, and it can, in many cases, be a very simple thing which will be just as effectual in the matter of side tracking the child's thought that is uppermost in the minds of those children—the possibility of being hurt—and at the same time interest those children in other matters by the use of a little psychology, not unlike that used by such men as Roosevelt and Sunday before their larger audiences. Such men are skilled in the art of "breaking the ice"—placing their audiences at ease. So with us, we should study carefully the art of making strange people feel at home if we look forward to establishing professional relations with them.

When a child hears its parents discuss, for the first time the question of orthodontic treatment, the first thought in its mind is: "Does it hurt?" It frequently happens that they are told by some playmate who is under treatment or who has been under treatment, that it does sometimes pain. Aside from the question of pain, there is another reason why children dread to start treatment and that is their natural aversion to meeting strangers, particularly is this true up to the age of seven.

"I refuse absolutely to sit in that chair, Mother," was the shrill remark of a nine-year-old son of an auto king recently on being brought to the office for orthodontic treatments. In talking this incident over with the family dentist, he was informed that there was syphilitic taint in the family and that another child

in this same family was similarly afflicted, making both children extremely difficult to care for.

In attempting to place under treatment these strange and unusual types of children, which is better—severity or indulgence? It is impossible to give a definite answer, as we deal with children as individuals. Some well-meaning people maintain that until the child has become a rational being it must be considered and treated as a little animal, because it has no sense of shame, or of the rights of property, or of social duty—that those methods which it most fears must be adopted—that is the whip or stick.

As a rule, special attention and indulgence should be shown to children who suffer from nervous fright, or are predisposed to it. One should be kind to them and not oppose their whims with too much severity. Their explosions of grief and nervous agitation are unfortunate; every violent emotion leaves a morbid tendency behind. Is it wise to oppose them? Is it not better in many cases to postpone matters until they become less sensitive, and until they have had time to think things over and reason them out?

When a timid and nervous child comes to one of our offices for the first time, and finds surroundings to which the child is a complete stranger and meets a strange office assistant, and also a strange man, who, he has perhaps heard, is going to cause him pain, and sees suspended from the ceiling or wall a dental engine, whose outline and music he is quite familiar with, is it any wonder that some children give way and are overcome with fear?

A clever, well-trained, and resourceful office assistant who is really fond of children, can do more in many cases in breaking down the feeling of dread and fear that possesses some of our children than any other means at hand. Sunshine, kindness, good stories, pictures of children at play and enjoying their pastimes furnish splendid mediums of establishing an acquaintance with the younger generation.

It has already been stated that some cases require considerable time, and one of our great overwhelming problems is to get children to like us. If at the beginning a child takes a dislike to you, it is better that the parents plan to change orthodontists. Results are not uniformly satisfactory when the proper regard and respect does not prevail between patient and operator.

Human interest works wonders in getting on with the younger generation. Know what the interests and hobbies of your patients are and ask questions in regard to them. Is there a boy anywhere who is not pleased when asked the score his football team ran up on the losing team? Is there any boy scout who is not pleased when you ask relative to the work of his troop? Likewise little girls are so pleased to have it said that their new dress is pretty, or when asked if they enjoyed a recent party. These things may seem to some of you as time thrown away, but to children they have much significance.

Children look at the world through different eyes than our own, and we would do well to get their viewpoint. While under treatment their interests should be our interests and if, in this way, you can make their lives brighter, coming to your office will become a pleasure, not a hardship. Among the boys the use of such terms as "Old Pal," "Old Man," or "Old Top," are names that please them.

With boys you strike a responsive chord at once if you make them out older than they really are. With girls there is no term that sounds so well as "Dear" or, if quite young, "Pet." It is the quick and proper use of these names in the offices that frequently paves the way to not only successful treatment, but to lasting friendships.

There exists among children two traits that are of genuine concern to the dental practice—anger and fear—and of the two, the latter is much the more common. Though for a stranger to ingratiate himself into the confidence and good will of an angry child, who has been brought to the office by a mother or nurse, is not always a simple task. It frequently involves the employment of much good judgment and tact, and then one sometimes fails.

Anger is hot displeasure due to a sense of injury or wrong. The right kind of anger, rightly governed and directed, is a powerful instrument for justice and good. The wrong kind may not only work disastrous injury to the object against which it is aimed, but usually exhausts the mind and body and weakens the nervous system of the child who gets angry.

With children you must keep open the door to the inner life, and understand its emotions. If you want to cure it of bad temper, or prevent it from having bad temper, it is well to understand the cause, the impression produced on the child's mind by the cause, and the line of reasoning by which it proceeds from the cause to the outburst of anger. Then, when you have found the cause and understand the nature of the anger, educate the child's will to overcome the tendency, and, most important of all, provide some other outlet for utilizing the emotional force in a useful direction.

Advise parents to encourage games that run to physical contest for the simple reason that exercising his physical muscles against an adversary develops the boy mentally, and gives the poise, the sense of justice and fair play, along with which anger of the wrong kind can not exist. The boy whose sense of personal dignity and worth is neither exaggerated nor too low will have the larger sympathy, the more pity, the better control of temper.

While anger among children gives us some concern in certain individual cases, it is fear on their part that is found to be the greatest obstacle.

The fears of childhood are many, and the first visit to a dentist or orthodontist is unfortunately frequently paid in apprehension or fear that the unusual might happen. And when one thinks of this subject in its broader aspects, it becomes a matter of very great importance, for if the first visits are comfortable and pleasant, it means a favorable impression has been made on the child's mind. If it happens that the child gets the opinion that it is not receiving good treatment, it may mean that the child will go through life with a neglected mouth, or with a bad malocclusion of the teeth, with its face devoid of harmony and symmetry which proper treatment would accomplish.

Mosso, the Italian author in his book entitled "Fear," states—"Every unpleasant thing told to a child, every shock, every fright given him will remain like minute splinters in the flesh, to torture him all his life long. These bad mistakes in dental education have not yet disappeared, for children are still frightened with the bogey man, with stories of imaginary monsters, witches, and a hundred other terrors which make the tears come to their eyes and spoil their disposition."

making their lives burdensome, which will make them timid, and shrinking for the rest of their lives. Anxiety, fear, and horror which come to many children through bad stories are miserable possessions which twine themselves into the memory, like so much deadly ivy choking the light of reason.

"The imagination in children is far more vivid and excitable than in adults. When a child is naturally timid, it is better not to leave it in the dark, but to have at least a little light in the room, so that, on waking, it may at once recognize the place, and its fancies may not seem real. The child's eye is much more apt than ours to trace pursuing spectres in the outlines of accustomed objects. The stories told them in the evening, any exciting emotions towards bedtime are quite sure to be reproduced in their dreams.

"The dreams of children are more real, vivid and fearful than is the case with adults, because their brain is so much more impressionable, as is shown by the fact that things seen in childhood are indelibly impressed on the memory, and because their weakness renders them more timid, exaggerates every danger and makes every enemy appear very formidable."

And in conclusion I wish to quote from Dr. Josiah Morse where he states:

"True courage is developed in the young, not by artificially insulating them against all pains and fears, but by teaching them to meet these bravely and wrestle with them until they are overcome. With fear, as with love, hate, anger, pity, etc., it is better for one's soul and character to have had the emotion in due measure and in due season than by artificial training to be kept in ignorance of some of them merely because they are painful. The soul of the overprotected child, like its body, is puny and delicate, and deficient in those fundamental qualities which make for true manhood and womanhood, just as the hothouse plant is inferior in taste, smell, and other qualities to those grown in the open fields."

DISCUSSION

Dr. Elizabeth E. Richardson, San Francisco, Cal.—Mr. President, Members and Friends of the Dewey Alumni Society: I wish to compliment Dr. Burke on the excellence of his paper as it contains some very interesting and important facts.

We know that much time and energy is being spent by men and women prominent in professions in the successful development of child study and education. Our schools on the coast have established classes for backward children. These classes are placed in charge of women teachers who have fitted themselves for this special work, with satisfactory results. Some of these children are being treated for defective speech by special trained teachers for this branch of work.

Many of these children are referred to the orthodontist for treatment. Each child is a problem in itself, and in the majority of these cases there is a lack of interest on the part of the patient. Here is where psychology is of value, as we must have cooperation.

To successfully control the different types of children is a problem we have to face daily, as there is no set rule. My idea in handling children is as individuals, remembering we are only grown up children. The mind of a child is sensitive and almost uncanny in the power to determine the real from the pretended.

I do not believe that force can be used in overcoming fear. Remember that attraction is the greatest power in the universe. Tenderness and earnestness will do much to win any child's confidence. I have found that the least attention paid to shy and timid children is the best, as they are easily embarrassed. It not only takes patience and tact with these little ones, but due consideration of their timid nervous tendencies, and the most sincere

desires, to enter and take any one of us through the portals of a child's heart, for are well guarded, not by doubt, but by discernment. The child, unlike the adult, sees imagination, and feels what he does not see.

It is necessary with some children to be firm to gain their respect and confidence; we must not defeat our purpose by doing the wrong thing at the wrong time. If the child is timid and nervous and becomes hysterical, I do not attempt anything other than to accustom him to the surroundings of the office for the first visit. A music box will be of great value in quieting the fears of these timid children. They will invariably ask the nurse to play it for them.

There is another side to be considered, as some children will take advantage of our least familiarity.

I agree with the essayist that we should feel it a pleasure to make the child's life brighter when it comes to us for treatment, as to be successful practitioners in orthodontia we must be humanitarians.

THE PRESIDENT'S ADDRESS BEFORE THE PACIFIC COAST SOCIETY OF ORTHODONTISTS*

BY JOHN RUSH MCCOY, D.D.S., LOS ANGELES, CAL.

ONCE more we as an organization have come together to discuss those problems which confront our special field of endeavor. As your presiding officer I am deeply gratified with the excellent work of the program committee whose efforts have provided material which should greatly benefit us as individuals and reflect credit upon us as an organization.

We may well recount with pride the volume of valuable program which has been presented before this Society during the last seven years, and when you consider the fact that each annual meeting evidences a creditable representation of our membership, it shows a healthy enthusiasm of our members, especially when you consider that our small body of men are scattered out over a narrow strip of territory two thousand miles long.

I think that the principal reason for this enthusiasm is the fact that we started out right at the first meeting by adopting exceedingly high standards, our by-laws requiring each member to contribute something to the program of each annual meeting in order to maintain his membership. Let us all see that this standard is continued.

Many orthodontic problems have presented themselves to the profession since the organization of this Society, and I feel proud of the fact that our membership has kept abreast of the times; and may it always be said of our Society that we have made it the instrument by which the membership will continue to progress in orthodontic science.

I am sure that you have all been looking forward to this particular annual meeting since the Society at this time has adopted the policy of bringing men from other sections of the country who have shown themselves to excel in some particular phase of our science.

We are indeed fortunate in having Dr. Mershon, of Philadelphia, as our guest this year to give us his valuable suggestions in lingual arch technic. Dr. Mershon has made an enviable reputation for himself, and I know that we shall leave this meeting greatly enriched with ideas which he will impart to us. Allow me at this time to quote Dr. Mershon's opinion of our responsibility and opportunity as orthodontists. He says, "My conception of orthodontia is that we are not only trying to restore teeth to what we have termed normal occlusion, but to restore the tissues and organs which constitute the oral cavity to normal function. From the time you start to treat a case of malocclusion with the lingual arch until it is finished it might be considered a continuous retainer, as it interferes so little with normal functions and is constantly assisting in the

*Read before the Seventh Annual Meeting of the Pacific Coast Society of Orthodontists, San Francisco, February 16, 1920.

development of these oral tissues in the direction of normal growth where nature has failed."

It has been said by another authority that "any ordinary orthodontist can move teeth, but it takes years of study and experience and observation to hold the teeth in their new positions." This, I believe, is the real big problem for us today. To my mind, the most important and probably the most neglected measure after efficient retaining appliances are placed is the establishment of, first, normal muscular influences, second, normal bone metabolism.

Dr. Alfred P. Rogers has contributed more than anyone else toward our knowledge of the physiology of muscles of the face and jaws. I consider Dr. Rogers' work on muscle training in its relation to orthodontia to be one of the great strides which orthodontia has made in the past few years, and I feel that any member of our profession who fails to use Dr. Rogers' suggestions is indeed missing a great opportunity to assist the tissues of the face and oral cavity to normal function.

I shall quote Dr. Rogers at length, as I feel extracts from his valuable treatise to be the final word on this most important subject. He says, "I have found, as you all have, that the muscular tissues of the face where they have once acquired the habit of bad behavior do not readily assume the normal. That some form of training was necessary became very apparent, and with this conviction solidly established, I proceeded to formulate and practice definite forms of muscle culture for the facial muscles. I soon found that in order to be successful in this branch of the work, it was necessary to make careful study of the various adjustments of the muscle groups, and that in order to obtain proper muscular control, we must also seek to obtain satisfactory mental control. And that it is necessary at the outset, in order to obtain results, that the parent and the child be convinced of the importance of the work and be given their part in the responsibility for future success or failure.

"In some forms of malocclusion, the unfavorable position in which muscles appeared to be placed to perform that particular work which they were supposed to do was apparent, and I became strongly convinced that these intricate muscles must be carefully trained in order to assume the exquisite positions in which their normal actions would place them. I soon discovered that ordinary muscle culture would not bring the desired results as quickly or as permanently as the thorough practice of conscious control over the facial muscles. The object of my efforts has been to teach those patients in need of this form of treatment to consciously use the muscles and forces of occlusion, after first becoming instructed as to their proper positions.

"This muscular work, of course, must go along hand in hand with mechanical treatment of the case, and no undue muscular pressure must be allowed until the patient has learned to place the arches in their proper relationship which function is taught them after the major interferences have been removed. The object of the work is to so strengthen the muscles of mastication that they will assume their normal function, not only resulting in a maintenance of occlusion but in building a stronger masticatory apparatus as well—that the so-called muscles of expression shall be so trained as to be under conscious control, and not allowed to 'run riot in response to almost every emotion.'

"It can be readily understood, then, that we are justified in concluding that our work will be even more enhanced if we are able to obtain the harmonious development of the entire organism.

"The principles of procedure are therefore: First, the mechanical re-establishment of arch form and cusp relation by the simplest mechanical means, thus removing any interference which tends to discourage the normal functions of the muscles. Second, the principle of muscular balance and mechanical advantage in the complete organism, including special guidance and control of those muscles concerned in the particular weakness upon which our attention is to be directed, urging them on to their normal development and strength until the harmoniously developed face completes the restoration of the organism to its normal inheritance.

"The orthodontist among his recollections of failures has a keen sense of the presence among that ghostly group of various forms of Class II which have failed of retention after his prolonged and conscientious efforts with intermaxillary elastics and various forms of retention. Failures of this nature would be much less common with us if the orthodontist understood and applied the principle of conscious control of the muscles of mastication, training them and causing them to do the greatest activity in their normal position.

"In contemplating work of this nature, the orthodontist must ever bear in mind the fact that muscles tend to stay in the position in which they do their most and hardest work, and that this work must be done with the arches in their true relation one to the other, for it is then that the masticatory apparatus has assumed the position of mechanical advantage, and it will be surprising how quickly the various muscle groups will respond to the work thus placed upon them, because they are in the position which nature has intended that they should occupy.

"It will be logical for us at this point to direct our attention to that most important group of muscles—the external and internal pterygoids. The advantageous positions which Nature has given these groups will be readily seen. They are the muscles which control the movements of the mandible. If the mandible is forced into distal position, these muscles soon form the habit of keeping it there. It may be well for me at this point to emphasize the importance of the early exercise of these muscles in cases where it is required. It is good practice in cases of Class II to train these muscles through exercise, so that the proper position of the mandible is readily taken when opportunity is given to it. It not only relieves strain upon the teeth, but avoids many other complications. Of course, there are cases in which light intermaxillary elastics will be found of advantage.

"The exercise of these muscles consists in throwing the mandible forward as far as possible. The patient requiring this form of exercise is instructed to throw the mandible forward as far as possible, or until the lower anterior teeth are placed in labial occlusion to the uppers, and held there for ten or more seconds and then slightly relaxed. The effort is then repeated as many times as the nature of the case requires. In some cases this will at first be found impossible, but after practice the work becomes easy. Very little of this exercise is sufficient in the case of some, while in others it is almost impossible to overdo it.

"After the ability to place the teeth in proper relation has been acquired another exercise is added—that of the temporal and masseter muscles. This exercise consists of holding the teeth firmly in occlusion and alternately contracting and relaxing these groups of muscles. In many cases it will be found that the ability to contract these muscles is very slight indeed, but after a few months' practice, the operator is gratified to find greatly increased tone and improved control, as is shown by the ability to contract and relax. All effort must be made with great concentration, and must be complete in their relaxation and their contraction. The ability to completely relax these muscles between each impulse is important to secure as muscles exercised in this manner, for physiologic reasons, grow stronger much more quickly.

"The group of muscles contiguous to the lips consist of the levator labii depressor labii, zygomaticus, orbicularis oris and platysma myoides. The names of some of these muscles indicate their function, and are perfectly well known to you. If they lack tone, or are not under control of the nervous system, they are the muscles which are most apt to place perplexing problems before the orthodontist. Most of these muscles are in some way attached to the orbicularis oris, and when we have a general lack of tone in all these muscles, there is sure to be a lack of balance between them and the inner forces, such as the tongue. There are numerous exercises which can be used for stimulation of this group, but it will be well for us to direct our attention to the orbicularis oris.

"Many of you, no doubt, have had difficulty in retaining the upper incisors in correct position. It is necessary, frequently, to apply retaining apparatus to effect this purpose, but if, in the meantime, this muscle has not been strengthened, in case it originally lacked tone, upon the removal of the retaining apparatus the incisors again become protruded. There are several cases in my practice where better results can be obtained in cases of this character without any retaining apparatus at all. One valuable exercise for strengthening the orbicularis oris muscle consists in pitting the strength of the thumb and first finger, or two first fingers, against the contractile forces of this muscle. Care must be taken in the performance of this exercise not to stretch, but rather to contract the muscle around slightly separated fingers; thus ensues a contest of strength between the orbicularis oris and the muscles of the fingers.

"It is frequently found necessary to prescribe a tonic exercise, which might be termed the exercise for general facial development. This exercise involves not only the orbicularis oris, but also the buccinator and all the small ribbon muscles which enter into a combination with the orbicularis oris. It consists in the use of warm water at a temperature which is bearable to the mucous membrane of the mouth, and in which has been dissolved a small portion of bicarbonate of soda. The patient is directed to take a sip of this solution, closing the teeth firmly in position, and with great energy forcing the liquid from the lingual cavity into the buccal. The exercise is usually done five times morning and night. The patient is directed to continue each exercise until the muscles are slightly fatigued.

"The platysma myoides is one which is of great importance when considering the correction of faults in the facial muscular development. This muscle has no bony attachments but is inserted in the fascia and skin of the pectoral

and deltoid muscles of the chest and upper shoulder at one end, and at its facial extremity is inserted by many fibers into the orbicularis oris and some of the other muscles upon or near their entrance into the same. It will then be seen that, if this muscle is contracted in its length by the bad posture of the patient, it has a tendency to stretch the weakened muscles of the face in directions which bring gentle but harmful pressure upon the fragile bony structure of the child's face. The exercise for this muscle consists in having the patient stand with feet together, hips slightly thrown back, directing the child to look straight to the zenith, at the same time drawing in the abdominal wall and turning the palms of the hands outward, making a slow and positive stretching motion with the tips of the fingers and the point of the chin. The child is then directed to relax somewhat, bringing the head and arms to erect position, then repeating the impulse."

I have put all these exercises to the test in my own practice with considerable success, so can highly recommend them to you. The pterygoid exercise in Class II cases, the masseter in open-bite cases and the orbicularis oris exercise in cases of short upper lip, the latter being extremely valuable in cases of habitual mouth breathers where every effort has been made to have the patient keep lips closed at night, this exercise being by far the best means of restoring normal function.

The second often neglected means of permanent retention is normal cell metabolism, particularly of the bones in which the dental apparatus is encased. I feel this is a subject which has been given entirely too little consideration.

Dr. Wenker who has given this subject exhaustive study tells us, "It has been evident for many years that the nutrition of the child in the first months of life is of great importance in relation to future growth. It appears that a given handicap to normal metabolism is more harmful in proportion as it occurs earlier in its life.

"Dietary considerations are therefore the next in order, and although the physician in charge usually attends to this requirement, still the orthodontist should be familiar with this subject that he may intelligently discuss it with the parents or physician in its relation to jaw development.

"Williams, an authority on obstetrics, has submitted evidence of the infrequency of normal nursing of infants. He makes the statement that less than 25 per cent of the mothers of New York State are able to nurse their children and that the number is decreasing. Hellman contends that arrested development of the jaws is more prevalent among artificially fed infants than among the breast fed. He has estimated that 81 per cent of arrested jaw development may be found in the artificial class."

Dr. Wenker reports that of 643 children he has found 508 cases of mal-development of the jaws in the artificial class, or a trifle over 79 per cent, and that there is a large percentage of arrested development among this class is very evident to the observing orthodontist, and this may be accounted for in the different proportion of the ingredients and digestible quality of cow's milk and other substitutes as compared with human milk.

Dr. Talbot, in discussing the diet and its relation to the teeth and the role of calcium phosphate in metabolism, says, "It must be considered from the point

of view of the metabolism as a whole, and of the metabolism in diseases of the bony structure, such as rickets, the commonest disease of the bones, and an affection of infancy. Rickets is the disease most often associated with delayed dentition; it is characterized by a deficiency of calcium in the skeleton. There seems to be enough evidence to conclude that certain abnormalities of digestion may also affect the absorption of calcium that rickets develops even when the food contains a sufficiency of calcium. According to a table prepared by Sherman showing the calcium contents of the common articles of food, beef, polished rice, and bananas are extraordinarily low in calcium. The more highly refined wheat the less calcium does it contain. Milk, oatmeal, and beans stand out as containing large amounts of calcium, and obviously should be given in large amounts when it is desirable to feed more calcium to the body. Phosphorus is necessary as well as calcium to form skeleton and teeth; it is deposited in both structures in combination with calcium. An abundance of phosphorus in suitable form is most readily and economically secured by the free use of milk, eggs, vegetables, and such cereal products and breadstuffs as contain at least a part of the outer layers as well as the inner portion of the grains. Plain cheese, containing all the calcium of milk, should be used much more often than is the custom in this country."

Dr. Wenker says, "In my estimation rachitis is one of the most important dietary disturbances in the entire list. I believe it is a much more active causative factor than it is generally conceded to be. Heretofore, we have only recognized it in its most pronounced form. As a matter of fact, there are a great variety of minor manifestations, and particularly that of arrested jaw development, which have in a large measure been overlooked. Lischer has called attention to maldevelopment of the mandible resulting from rickets. Holt and Fischer have also mentioned it as a factor, but in a rather general way. In studies and clinical observation it appears that in every case of rachitis with some of the gross classical symptoms there is usually a marked jaw deformity. There is also a large percentage of cases with minor general bone involvement which manifest comparatively mild forms of jaw deformities. Dewey has called attention to the early shedding of deciduous teeth and tardy eruption of the permanent teeth in rachitic children. The absence of mechanical stimulus to the jaws supplied by erupted deciduous teeth from the shedding until the eruption of the permanent teeth must have a detrimental effect on their growth. No one has discussed this mechanical stimulus imparted to the growing jaws by the presence of the teeth. There is also manifested in rickets a tardy eruption of deciduous teeth which frequently causes much difficulty, such as inflammation, pain, and suppuration. The artificially fed class, however, does not supply all of the cases of rickets."

There are no drugs known that will affect the growth of teeth. Rickets is said to be affected favorably by teaspoonful doses of phosphorus and cod liver oil in the proportion of 1:3000.

There is little doubt but that we have all had our troubles in maintaining good results in these cases where there is a tendency toward rachitis, and it seems to me that by starting early to prescribe a diet, even a year or so before our

chanical treatment is started, we could save ourselves considerable embarrassment which is bound to come when our retaining appliances are removed.

I am particularly glad that we are to have a paper at this meeting along these lines by Dr. Fleischner who is eminently able to give us some valuable points.

In closing, I wish to thank those who have made this meeting possible, and Dr. B. Frank Gray, in particular, who has worked unceasingly as chairman of the program committee.

DISCUSSION

Dr. A. E. Scott, San Francisco, Calif.—I want to thank Dr. McCoy for his excellent paper, and I think that we should all feel very grateful to him for having so vividly called to our attention the many good things that it contains. Very often we are apt to read a thing, give it what we consider a fair and honest trial, and accept or reject it without giving it a proper amount of consideration. I think the mere fact that we are going back to some of the things that were done several years ago proves this contention. Not many years ago the medical world knew very little about the appendix. Then someone discovered that in some instances it was the source of trouble, and not long afterward most every patient was losing her or his appendix. "It is not good to keep something that is so apt to do harm," they argued. But now they have decided that certain conditions warrant the removal of an appendix; some should come out, while others should remain. So it is with orthodontic procedures. Some have real merit, while others have very little or none.

For some time I have been interested in Dr. Roger's muscle training and development. It occurred to me when I was in the army and had to do a certain amount of calisthenic exercise each day, which, as I understand, was for the purpose of bringing about a proper functional activity of the body, that the same thing applied to the muscles of the face would bring about a more normal development of the parts which they control. Some people are able to move the scalp and a few the ears. Whether this is muscular or nervous development I am unable to say.

I think that none of us any longer confine our attentions to simply correcting malocclusions from a mechanical standpoint. We not only attempt to establish normal occlusion, but normalities in breathing, mastication, speaking and finally in appearance. What we wish to do is to establish a condition as nature intended—one which she herself would have produced had her course not have been interfered with by some known or unknown cause. Almost every day I am convinced that there are cases that we would be much better off to leave alone unless we can discover and remove the cause of the disturbance. It seems to me that our position is similar to that of the novice who goes in search for gold without knowing its color, specific gravity and other characteristics. Sometimes we would not recognize what we are searching for if we should find it.

I shall not attempt to add anything to the work of such an eminent authority as Dr. Rogers. From all indications I think that his work has a real practical value in every-day practice; that it is the result of considerable thought and study; and that in presenting it he has done much to make a greater percentage of our cases successful. I think that we can not doubt its value any more than we can doubt the value of training on the athletic field or in the gymnasium. In the consideration of any face we must keep in mind that the maximum beauty for that particular face is only obtainable when the teeth are in their proper position not only at rest but in function as well. From what little I have been able to learn and observe, we seldom, if ever, get what we term a "mouth full of teeth" when cases are treated before the age of twelve years. A case should be considered successful just in proportion to its degree of retention and its retention is just in proportion to its proper function. No doubt more so-called pyorrhea results from improper function than we are prone to admit.

Heretofore little or no attention has been paid to the teeth from a medical stand-

point. Bad teeth may be the cause of a deformity. Rickets is a disease caused by nutrition with lack of lime salts and characterized by bow legs, flat feet, etc. This is not only due to quantity of food, but quality as well. With poor teeth the child cannot masticate food, and therefore can not obtain sufficient nutrition. Whether rickets is the cause of poorly formed and malposed teeth, or poorly formed and malposed teeth the cause of rickets, I am unable to state. However, I believe that the juice of an orange given a child once a day until the age of five or six is reached is almost specific for this disease.

Artificial feeding of infants is certainly most unnatural, and being such, we should expect some astounding results not only from the food itself but from the mode of taking it. The breast is so constructed that the pressure is more or less equal from within and without. With the ordinary artificial method of feeding pressure is produced in such a way as to cause an abnormal shaping of the bones, thus carrying the teeth with them into malpositions, if not malformations. I trust that Dr. Fleischner will give us some interesting information on this subject.

Dr. H. L. Morchouse, Spokane, Wash.—Dr. McCoy's address has been most interesting. He has spoken of the work of Dr. Rogers in his efforts to secure better muscle tone and to assist in the correction of malocclusion, and while I have not given it a study I have tested it somewhat in a few cases during the past year. I would believe in order to get proper results from this muscular training, we should start at an early age. I think in many cases of Class II we find a condition of "backward development" in the mandibular articulation caused from the muscular pull on the jaw and bring about the locking of the teeth in distal occlusion. In two specific cases I have started at an early age and have secured beneficial results in Class II cases of that kind. In fact in a short time these patients were unable to get the distal occlusion at all. I do not know how far this work can be carried, but it is my opinion that if it were started carefully much could be done toward the elimination of a lot of tooth movement and unnecessary bone development in the direction we usually carry our cases.

In regard to another character of case, such as the undeveloped symphysis, I may make some comments, but will not do so as I shall bring that out in a paper I shall publish later.

In writing to Dr. Rogers I learned there were certain conditions impossible to correct come even by these methods, although carefully and skillfully applied.

Dr. John V. Mershon, Philadelphia, Pa.—I wish to express my appreciation of the presentation of the correlated symptomatic conditions Dr. McCoy has so splendidly set forth relating to many of our problems. He has touched on a matter vital to the problems concerning the orthodontist of today, and which has to be combined with appliances, with muscular training and with everything else we do, that is, nutrition; I think our nutritional disturbances are the fundamentals of all our troubles.

Dr. Wm. Cavanagh.—I feel our president has given us ample subject-matter for an all morning discussion, especially as to muscular development, and also the condition recognized as of rachitic origin. I believe we have felt in those cases where we note permanent teeth are pitted on eruption, with faulty enamel development, etc., we also find a very faulty development of the osseous tissues, and we find such teeth resist movement to an extreme degree. I have a patient at the present time of ten or twelve years of age whose teeth are as rigidly fixed in the bone as those of other individuals of thirty or thirty-five years of age. We do attempt treatment of some of the latter. In my experience I find when the time comes to remove the regulating appliances and put on retainers, we must state to those patients and the parents, that retention will cover an indefinite period because of the condition that is present.

I have sent a number of such cases to physicians and their prescription is "cod-liver oil" or "foods"—or an emulsion of cod-liver oil, and every one of those patients whose teeth resist movement in that manner, will avoid a fatty diet. I have questioned dozens

ts and learned the children do not like fats of any kind, and so I think there is a
on as between the lack of appetite for fats and the resistance of those teeth to
ment.

As to muscular development for the correction of unbalanced muscles, I think it
d be of great assistance in Class II, Division 1 cases. I believe such cases are all
ntable if we could prescribe the use of some musical wind instrument at an early
hat would develop the labial muscles, and I do not think under such circumstances
ould ever have a case of protruding upper centrals and laterals with those children
exhibited that tendency to begin with, if they were taught and compelled to practice
e clarinet, slide trombone, cornet, etc. I have worked for patients who have prac-
on such instruments from childhood, and the lips were so rigid it was difficult to
them out of the way of the work. I noticed it in general practice especially, and
e case of correction of malocclusion where the central incisors were tipped lingually.
s due to over-development of the labial muscle and I doubt if we can retain the
in normal position on account of the overdevelopment of the upper lip. The same
occurs in harelip that has been operated on. I undertook the correction of one or
of those cases. Never again! The contractile tissue will force the central incisors
ally in spite of your efforts.

HISTORY OF ORTHODONTIA

(Continued from page 167)

BY BERNHARD WOLF WEINBERGER, D.D.S., NEW YORK CITY

DR. LEVITT E. CUSTER in the *Ohio Journal of Dental Science*, 1888, under *Intermittent Pressure, Its Relation to Orthodontia*, states:

"To move teeth in the alveoli, we are dependent upon the same fundamental principle of the animal economy as that by which all change of shape in osseous structures is accomplished, namely: resorption and deposition. The theory was once held that there is an actual digestion and excavation in one portion, and a new deposition taking place in another. During the preparation of the lower jaw for the permanent molars, the ramus is carried back, not by an interstitial development, but by a resorption anteriorly, and a deposition posteriorly. When lime salts have once been deposited as the basis substance of bone, they, by virtue of their intense hardness and heterogeneous nature, retain that form until reduced by retrograde metamorphosis to the embryonic condition.

"Resorption, as a physiological process, takes place under the agency of a class of cells which may be understood to have a retrograde function. They break down tissue already built, and under accidental conditions reduce foreign substances of animal origin to a condition fit for assimilation by osmosis. Such cells, according to where found, have been termed leucocytes, giant cells, osteoclasts or odontoclasts.

"The above cells, even though of retrograde function, like all others are brought into action by adequate stimuli. Every different cell requires a special excitation; for the cells of the salivary glands to act, there is reflex nervous irritation originating in the gustatory cells; for muscle cells, motor impulse; for giant cells, a thrombus, an infarct or foreign body; for odontoclasts or osteoclasts, the effort of nature to change the size or shape of a preexisting osseous structure. Osteoclasts are also stimulated by pressure, and upon the latter do we depend for change of shape in the alveolar process for correcting irregularities. When Nature has once fashioned the alveolus and the arrangement of the teeth to satisfy our own typical demands, we can ask no more of her as a stimulant, but must resort to the other method; namely, pressure. All the forms of pressure for regulating resolve themselves into either of two classes of forces, intermittent, or constant. Under the former may be classed those forces which move to a definite distance and there remain stationary, such as the screw in all its forms; under the latter, constant force, all those which bear with an elastic or continued pressure, such as the spring or rubber bands. Intermittent pressure acts intermittently as such because the space gained by absorption is not followed up immediately by new pressure only as it is applied by the operator.

"The method by which giant cells, leucocytes, osteoclasts or odontoclasts,

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ls of retrograde function, reduce substances has been designated by *Dr. Black* resorptive digestion. We understand these cells to have the property of flowing out a digestive fluid which acts as a soluble ferment analogous to that of ptyaline, pepsin, or trypsin. In each case this fluid varies according to the nature of the object to be digested. *Krause* maintains that in absorption of serous tissue this fluid is lactic acid. In order to act, these cells arrange themselves as to be in direct apposition with the part to be digested, they become in actual contact. Implanted teeth, the roots of which are undergoing absorption, contain pits which are lined with odontoclasts. In the formation of sequestra in bone, osteoclasts are found at the line of union of the dead with the living; granulations are surrounded and crowded with leucocytes. In sponge-graft, granulations are filling up the pores while giant cells are preparing the walls for osmosis, and blood clots become organized by the presence of connective tissue cells." *Dr. Black* says, "The osteoclasts are not attached to the surface of the bone or held by any mechanical means whatever; they simply lie against the surface and are detached with the least movement. They act only, however, when lying in contact with the surface. Any intervening substance whatever will prevent their action.

"From the foregoing it is evident that the action of osteoclasts may be weakened or entirely suspended by either of two conditions; dilution of the digestive fluid, or separation of the cells from the point of absorption. When resorption is produced artificially, and it is agreed that pressure is necessary to stimulate osteoclasts, as the result of pressure there are associated conditions affecting the action of these cells, which vary according to the method used. By one method of pressure the digestive fluid may be weakened, or by another the cells may be separated from the seat of absorption by intervening bodies. Any form of pressure in orthodontia, if continued long enough and hard enough, will produce hyperemia followed by inflammation and possibly suppuration or abscess. When hyperemia occurs we have a serous and a corpuscular exudate which infiltrate the surrounding tissue. Serum being a liquid which in small quantities is taken up by the lymphatics, but when increased, producing edema, readily comes in contact with the digestive fluid of the osteoclasts which is diluted and resorption retarded. On the other hand, the blood corpuscles of hyperemia not being liquid insinuate themselves between the cells and the point of absorption and become a mechanical obstruction to their action. In inflammation we have as well as the serous and corpuscular, an additional one, fibrinous, which at first acts mechanically and after liquefaction becomes a menstrum for weakening the digestive fluid. The result of mechanical obstruction to the action of these cells is no better shown than by the resorption of the roots of temporary teeth where the process is stopped by the occurrence of abscess. In this instance the resorptive cells become disseminated among the pus corpuscles, and not being able to act unless in contact, the process ceases. Resorption is more marked when the digestive fluid is undiluted, but when it is disseminated in the serous exudate of hyperemia, fibrinous exudate of inflammation or the pus corpuscles of abscess, it becomes retarded. Herein lies the problem of the efficiency of the different methods—to stimulate retrograde cellular activity without producing excessive hyperemia or inflammation.

"Cognizant of the fact that resorption produced by artificial means or by external agents is not to be compared with nature's physiological process in that we have to deal with two opposites—to stimulate osteoclasts by pressure and at the same time prevent excessive hyperemia and inflammation, the result of pressure—we may yet by a peculiar method of pressure produce a process approaching very closely nature's own. Such a method of pressure, besides being sufficient to stimulate osteoclasts to action, will allow, first, regain of tone to the blood vessels and lymphatics in the region of pressure; and second, it will allow free exchange of pabulum and rapid entrance into the lymphatics of the dissolved bone tissue. Of the first condition, I say there will be regain of tone in the vessels, because pressure of any kind tends to paralyze the vasomotor nerves in that region and hyperemia will result. Let the pressure be continued and the exudates of hyperemia will follow, which will retard the action of the osteoclasts in the two ways that have been shown. On the other hand, let there be an intermittent pressure, and the room gained by the osteoclasts while under pressure will allow regain of tone to the vessels during that period which some have denominated 'rest.'

"The osteoclast, like all other cells, has three properties, ingesta, assimilation, and excreta; it also ceases to act when this excreta is not removed. Since the lymphatics under pressure can not so readily absorb the waste products of the body, and since under continued pressure we have continued stimulation and continued action of osteoclasts, as a result, we have a continued formation of excreta in the most unfavorable conditions for its removal; but let this pressure be such that it will expand to a definite distance and there remain stationary, then the space gained by active work of the osteoclasts before their action is stopped by the excreta or dissolved lime salts will allow their escape by the lymphatics which have regained tone. Under continued pressure there is not a free exchange of fluids; mechanical resistance keeps back pabulum, and the osteoclasts become surrounded by their own debris.

"Besides the peculiar fitness and adaption of intermittent pressure in the above two fundamental conditions for a physiologic performance of resorption, there are other minor qualities which render it still more desirable as a system of pressure to be used in orthodontia. More force may be applied by this method than by the other, and the teeth acting as a lever will under this increased force produce enough pressure, not on the edge alone, but in the body of the alveolus to stimulate osteoclasts in that portion. Were elastic pressure applied even to inflammation, this would not be strong enough to produce resorption at any other point than directly opposite the tooth. I think there is more in this than we are willing to admit. To produce any other resorption than opposite the tooth by elastic force the peridental membrane would run high in inflammation. This is an easy thing to accomplish with intermittent force since we are able to apply many times the amount of pressure with less danger of inflammation.

"It is a *positive* method, and distance gained by its use is definite; it may be measured with mathematical precision; also holds what has been gained.

"It needs no renewing; once in place it may be used, as a general thing, until the end is accomplished. As a result the new depositions of osseous materials are not interfered with as they would be when the tooth is drawn back by

the fibers of the periodontal membrane during the change of apparatus; the path of pulps has been attributed to breaking or changing of appliances.

"Under intermittent pressure we have a work almost painlessly performed, because more nearly a physiologic process. According as are all either constructive or retrograde processes physiologically performed are they painless, and as they approach the pathologic do they become painful. We have a work more progressive, because of continued action under natural laws—not an action that is half inflammatory; and a work that is more effective, because produced by appliances which work more in harmony with nature, which allows regain of tone, the exchange of pabulum, and more favorable conditions for contact of resorber with resorbed, and an undiluted action of the digestive fluid."

A. Sternfeld—1891, exactly forty-four years after Carabelli's, a book on the same subject was published by Sternfeld, "*Eissarten und bissanomalien*" (forms of bite and anomalies of bite); and in 1891 the same author published in *Handbuch der Zahnheilkunde* an article on *Anomalien der Zähne*.

In the last-named article Sternfeld introduces a nomenclature which has for its basis terms employed in anthropology. He recognizes two classes of occlusion—a physiologic or ethnologic, and a pathologic.

"The first class, the ethnologic, comprises the following named species: (1) Orthognathia dentalis: Normal bite. (2) Prognathia ethnologic Prognathism. The same condition exists here as in (1), with the difference that here the maxillary teeth have a forward direction. (3) Orthogeneia: Edge-to-edge bite. (4) Progeneia ethnologica: Protrusion of the mandible.

Under the Pathologic forms of occlusion Sternfeld ranges the following: (1) Prognathia pathologic: Protrusion of the maxilla. (2) Orthogeneia pathologica: Pathologic edge-to-edge bite—which he says is very rare. (3) Orthognathia pathologica: Pathologic normal bite—which is also seldom met with. (4) Progeneia pathologica: Pathologic protrusion of the lower jaw; not rare. (5) Opisthogeneia: Retrusion of the mandible. (6) Opisthognathia: Retrusion of the maxilla.

By combining two distinct forms of the anomalies, expression can be given to certain sub-forms, e.g., a retrusion of the maxilla (opisthognathia) with a protrusion of the lower (progenia), i.e., progeneic opisthognathism.

In general, Sternfeld applies the term "gnathia" for the upper and "geneia" for the lower jaw, and uses the prefixes "orth—," "opistho," and "pro(s)—" to indicate the position of the teeth, whether straight, backward, or forward.

Sternfeld cites as an example of ethnologic progeneia the ancient Frisians, and gives this on the authority of Virchow, who in his "*Beiträge zur physischen Anthropologie der Deutschen mit Besonderer Berücksichtigung der Friesen*" (Contribution to the physical anthropology of the Germans, with special reference to the Frisians), 1877, claims for the ancient Frisians protrusion of the lower jaw as a racial characteristic, and in support of his conclusions gives a few drawings of ancient skulls. In the text, however, we find some passages which make it extremely doubtful whether the conclusions of Virchow are correct.

Joseph Iszlay—Before the dental section of the *International Medical Congress* held in London in 1881 Iszlay read a paper entitled "*Illustrative Skizzen in Carabelli's Mordex Prorsus und desen Verhältniss zur sogenannten*

Prognathia ethnologic und Meyer's Crania Progenaca," in which the author proposes a new nomenclature for the forms of malocclusion.

Ten years later, in 1891, *Iszlay* published a short paper on the same subject in the *Oesterreichisch Ungarische Vierteljahresschrift für Zahnheilkunde*, which paper may be considered a revised and condensed edition of that which he read in 1881.

Iszlay suggested a new classification for the various ways of biting and the anomaly of the position of the teeth. He considered the classifications heretofore given as inadequate and not clear and distinguished the following as the chief forms of irregularities, using the upper teeth as a basis.

In the *Fourth International Dental Congress*, 1904, page 326, vol. II we find *Iszlay's* classification.

"(I) The front teeth of the lower jaw strike back of the upper teeth: *Enarmosis*.

"(II) The front teeth of the lower jaw strike in front of the upper: Protrusion of the lower teeth: *Epharmosis*.

"(III) The cutting edges of the lower teeth meet the same edges of the upper teeth: Edge-to-edge bite: *Prosarmosis*.

"(IV) Between the upper and lower teeth there is an open space: Open bite: *Opharmosis*.

"(V) The lower teeth cross the upper teeth: Cross bite: *Dicharmosis*.

"(VI) The odontharmosis is mixed up: Mixed bite: *Tyrpharmosis*.

"Genus I. *Enarmosis*: Normal bite. The teeth of the mandible strike back of the lingual surface of the upper teeth, leaving hardly any space between them, the teeth of the mandible being overlapped by those of the maxilla by one or two millimeters.

"Species 1. The same relationship as preceding, with the difference that there is a greater distance between the labial surfaces of the lower teeth and lingual surfaces of the upper teeth: *Di-enarmosis* (away from).

"Species 2. The same relationship as in species 1, with the difference that the lower teeth are here overlapped to a greater extent by the upper teeth: Deep bite: *Dys-enarmosis* (wrong).

"Both classes appear either separate or combined; in the latter case we have protrusion with a deep bite: *Dys-di-enarmosis*.

"Genus II. *Epharmosis*: Protrusion of lower teeth. Here the relationship between the lower and the upper teeth is reversed. The lower teeth stand in front of the upper and are overlapped by the upper teeth to the extent of one or two millimeters.

"Species 1. The same as species 1, genus I, but reversed: Protrusion of the lower teeth, but being greater it is called *Di-eppharmosis*.

"Species 2. The same as species 2, genus I, but reversed: Deep bite with lower teeth in front—*Dys-eppharmosis*. Where both species are combined we have more or less protrusion with a deep bite: *Dys-di-eppharmosis*.

"Genus III. *Prosarmosis*: Edge-to-edge bite. It comprises those cases where the cutting edges of the lower teeth meet the cutting edges of the upper. (No species.)

"Genus IV. *Opharmosis*: Open bite. Here are included those cases where

on closing the mouth the molars and premolars or the molars alone meet, leaving an opening between the front teeth. (No species.)

"Genus V. *Dicharmosis*: Divided, cross bite. Characterized by a combination of the foregoing genuses; one side may be enarmotic, the other epharmotic, etc.

"Genus VI. *Tyrpharmosis*: Mixed bite. Here the odontharmosis is so mixed up that it can not be grouped under any of the genuses enumerated, either in one or two combinations."



Fig. 1.

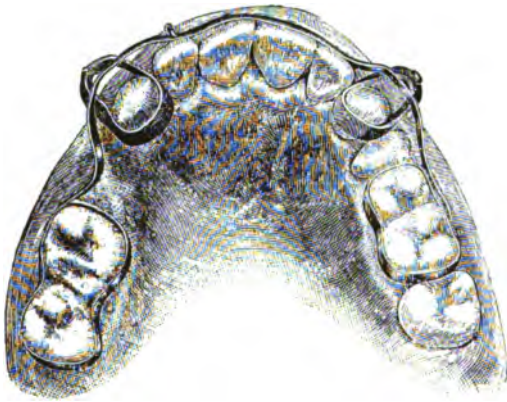


Fig. 2.

E. Henry Neall, Cosmos, 1892, page 975, Protrusion of the Inferior Maxilla: A Case in Practice:

"The first and only appliance for the lower jaw (Fig. 1) was placed in position December 15, 1890, and consisted of a frame of platinized gold, having hooks soldered to the inner part and setting well back of the teeth, being held in position by vulcanite attachments surrounding and covering the molar teeth on each side, which also served to open the bite. These were cut away on the occluding surface from time to time, as the changes produced in the articulation rendered necessary. Rubber bands cut from French tubing were then placed around each of the protruding teeth and attached to the hooks on the frame.

Pressure was also brought to bear upon the body of the maxilla by a cap-bandage worn day and night, and only removed for a short time at intervals. The patient was instructed to press the jaw upward and backward with the hand. Her treatment, ably seconded by the patient, was used from the start.

"On the commencement of the fifth week, January 16, 1891, an appliance was made for the upper jaw (Fig. 2) consisting of a platinized gold frame (with two hooks over the cuspids) extending outside the teeth and cemented by oxalophosphate of zinc to the molar teeth. This was worn just two weeks, and was used to pull forward the cuspids. With this exception, no pressure was used on the upper teeth, as the jaw was normal and did not need to be changed.

"To the question, What was accomplished? I answer, several changes took place. First, the lower teeth were brought inward and close together; second,

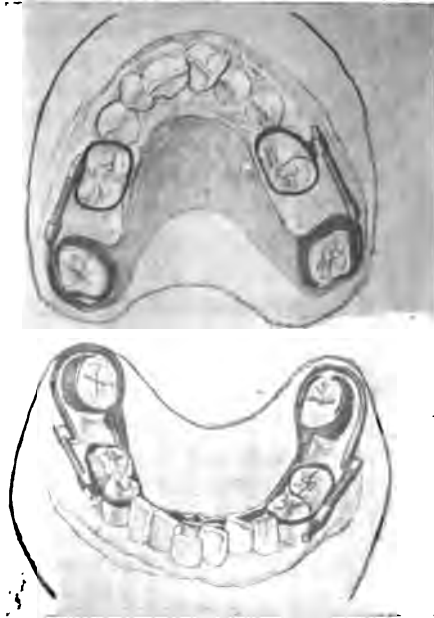


Fig. 3.

a change was undoubtedly made in the articulation of the condyle of the inferior maxilla with the temporal bone; and, third, I believe a shortening of the angle of the jaw took place."

Otto Walkhoff, "*Die unregelmässigkeiten in der zahnstellung und ihre behandlung.*" This book of 180 pages treats of irregularities of the teeth and their correction. Walkhoff describes the method of his co-workers then in use and his own methods of handling these complex conditions. He himself contributed little that was new.

C. Sauer 1877 contributed a great deal toward the development of Orthodontia. He stated "that irregularities of the teeth were due, in part, to the influence of the cheeks, the lips, and the tongue." He studied many cases where the projecting teeth seemed to be caused by tongue sucking. Figs. 3-6 show some of his devices to correct malocclusion of the teeth.

L. C. Bryan: Dental Review, 1892, page 859, under "*Surgical Treatment of Irregularities*" states—"The treatment which I have finally adopted is to inject cocaine and either partially cut away the thick intervening alveolus with file and long fissure burs, or, when the alveolus is thin, bodily wedge the outer alveolar wall away with a half round, wedge-shaped chisel, by inserting the point of the instrument between the tooth crown and the bone, and forcing it up along the root until enough space is secured for the tooth to be brought out into place outside the lower tooth. This latter I formerly accomplished by pressing the above wedge-shaped instrument or the inner beak of a suitably formed forceps up along the palatal surface of the tooth until the crown was



Fig. 4.

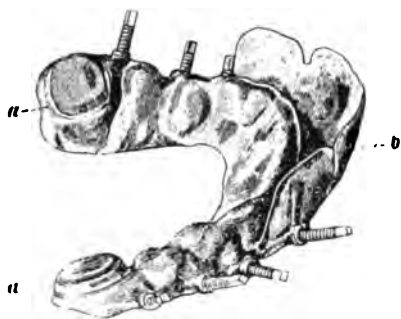


Fig. 5.



Fig. 6.

forced outward sufficiently to be firmly grasped. It was then brought gradually into place, and secured with a small plate, or ligatures. My present method of operating on these cases is much simplified by the forceps and fulcrum which are herewith presented (Fig. 7).

"This pair you will see has lobster claw-formed jaws, or more resembles the Tapir's jaws with round drooping proboscis and the short receding lower jaw.

"This curved long round serrated jaw rests on a fulcrum fitted to the arch of the maxillary to be operated on, and the short beak pushes against the palatal aspects of the tooth to be brought out into line. I consider it absolutely necessary to lift the outer alveolar plate before attempting regulation on account of the great danger of accident to the pulp if the alveolar margin including the solid septa between the teeth is not broken up. The outer alveolar plate must be broken

up nearly as far as the apex, that the apex shall not be moved in its position, otherwise the nerve will be cut off by any considerable lateral movement of the point of the root."

Frank French before the *First and Second District Dental Societies, New York, Cosmos*, 1893, page 116, read a paper entitled *Orthodontia*.

"Congenital orthodontia is much harder to treat than acquired, as the forces of nature are all against us, and the teeth are more liable to return to their former position.

"The kind of appliances to be used must be determined by the judgment of the operator, and fortunately we have quite a list to choose from; but whether we choose levers, jackscrews, rubber plates and ligatures, piano wire, any or all of these, we will often find our skill and ingenuity taxed to the utmost to accomplish the desired result."

"I removed the band from the bicuspid and molar, and lengthened it

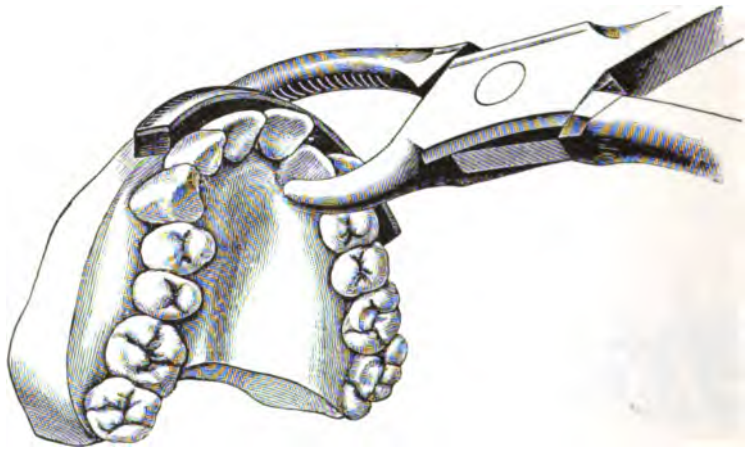


Fig. 7.

as to take in the second molar, and again attached my ligatures; this time the teeth all moved, that is, the bicuspid and first and second molars moved, but the cuspid did not stir. Now, here was my error. The points from which the force was delivered were not so strong as the point of resistance; still, I think that almost any one would have made a similar mistake, as three teeth ought to have greater powers of resistance than one. I then made a rubber plate, with gold clasps around the bicuspids and molars on both sides, as they were in position and did not wish to move them, and attached a spring of piano-wire with a simple coil, starting from the posterior surface of the right cuspid, passing back of the incisors, and ending with a loop at the point I wished the left cuspid to occupy. I then attached with a silk ligature the wire loop to the eye on the cuspid, drawing it as tight as possible, and this time something moved, and it was the cuspid. I soon found, however, that this was drawing it in too much, and not moving it backward as far as necessary.

"I then made another rubber plate, but with a long spring extending from the right sixth-year molar to the left one, but without any coil, and ending in a loop. I attached this loop to the loop on the cuspid by a silk ligature drawn

tly, so as to give tension to the spring, and the tooth was drawn into place without any further trouble. I used silk ligatures instead of rubber, because wire spring gave it all the tension necessary. I placed small pin-heads on plate, on both labial and lingual surfaces, at proper points, and attached rubber ligatures from lingual to labial pins, passing between the teeth, and the incisors and right cuspid were readily moved into position. The rubber plate extended in front of the lower teeth as well as in the rear, but is not shown in the diagram. The lower teeth being now in position, I swaged a thin plate of gold, covering the cutting-edges and extending downward on labial and lingual surfaces about one-eighth of an inch from bicuspid to bicuspid, including both, and cemented it firmly in position (Fig. 8).

"I then extracted the first bicuspids on both sides of the superior arch, for

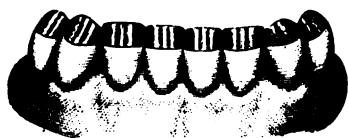


Fig. 8.

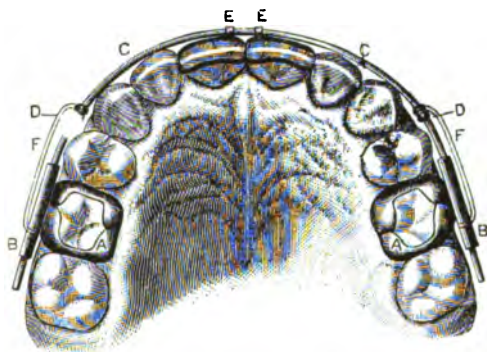


Fig. 9.

all the teeth were equally good, there was no choice in that respect, and it was one less to be moved on either side. Then an accurate impression of the first molar on either side was obtained, and a platinum band swaged so as to fit closely and coming up over the grinding surfaces a little (A, A, Fig. 9). On the buccal surfaces of each, and running at right angles to the long axis of the tooth, was soldered a gold tube about one-half inch in length (see B, B, Fig. 9), and the band fastened firmly to the tooth with cement. A piece of gold wire, No. 18, long enough to reach around from second molar to second molar, was bent so as to form an arch of the shape desired for the teeth when in position, and soldered accurately to slide in the tubes on the molars and yet move easily (C, C, Fig. 9). At a point just in front of the bicuspid a narrow tube of gold was soldered on the gold wire (D, D, Fig. 9). A narrow band of platinum was swaged to fit each of the centrals, and a small groove of the same material was soldered to each band at right angles, a very little removed from the median line

(E,E, Fig. 9). This was to prevent the gold wire from slipping up and down, and also to hold another part of the appliance in position.

"The wire was then placed in position as seen in Fig. 9. A piece of heavier gold wire was then bent so as to conform somewhat to the shape of the mouth when closed, extending a little beyond the corners of the mouth and ending in a hook at right angles to the face. Exactly in the center, and at right angles, a piece of gold wire was soldered in the center, and at right angles, a piece of gold wire was soldered with a groove at the farther end to fit the arched wire already in the mouth, and of sufficient length to allow the lips to close readily when this was placed against the tooth. A silk traveling cap was adjusted to the back part of the head, two pieces of elastic braid were fastened to each side, one above and one below the ear, so that when brought together at the angle of the mouth the tension would be equal, and a small eyelet fastened in the end of each. A short rubber was looped around the regulating bar, just in front of the small tube, brought back and hooked over the end of the bar at this point (F,F, Fig. 9). The pressure from this rubber was not great, but was sufficient to retain what space may have been gained. The front bar was then placed against

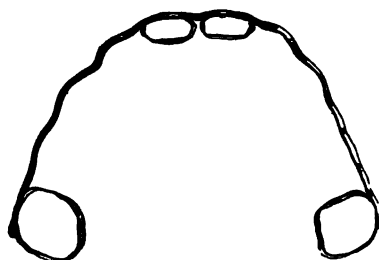


Fig. 10.

the regulating bar, the saddle resting against it at the median line, the elastic bands from the cap hooked to each end of it, and I had something that worked nights and Sundays.

"The pressure from this appliance was so great and got up so much inflammatory action that she was instructed to wear it only at night, the rubbers at each end retaining what had been gained.

"A retaining appliance was fitted; and now a word about retaining appliances. I believe that they should be made as light as possible, and retain the necessary strength. I also believe that they should be made non-removable as a rule, for I think they do the work better. Wherever I can, I use a small gold wire swaged so as to fit as closely as possible to the labial surface of the teeth. A piece of platinum is then swaged to fit the first or second molars as in (Fig. 9) whichever may be used. In this case, bands were also fitted to the two centrals; then all the bands were soldered to wire (see diagram, Fig. 10) and cemented to the teeth, and worn without removal for a year; after that, worn nights for six months to insure safety.

"This kind of a retainer is not inconvenient for the patient, does not look badly, and is cleanly. I use round wire instead of half-round, because there is less substance in contact with the teeth, and it is more easily kept clean."

H. Lindenberg, *Cosmos*, 1893, page 500: "A band is fitted to each of the central incisors and the two second bicuspid or first molars; the central bands are soldered together, at the same time attaching a small strip of plate, which on being bent upward, forms a support for the center of the curved wire. Upon the palatal surfaces of the posterior band is soldered a section of split tubing, which forms a trough against which the extremities of the wire rest. When the appliance is thus far completed it is placed upon the model, and a piece of wire of sufficient length is bent to conform to the inner surface of the arch (assuming somewhat of a U shape). This wire, as will be noticed, is not attached to the other parts, hence admits of easy removal, either for cleansing, adjusting, or to substitute a larger or smaller wire, to produce greater or less pressure as the case demands (Fig. 11).

"A slight modification of this appliance may be made to include another class of irregularities; viz., protruding centrals.

"In such cases the first bicuspid, or possibly the cuspids, should be banded, instead of second bicuspid or first molars; then, proceeding as before, both



Fig. 11.

traction of centrals and expansion of arch can be accomplished simultaneously.

"Should a tooth be inside the arch, by shaping the wire to strike this tooth it may be forced into proper position. A tooth outside the arch may also be brought back by attaching it by ligature to the wire.

"Thus while teeth may be brought into proper position in the arch, the process of expansion may proceed at the same time, if desired. This process is applicable with equal facility and effectiveness to either the upper or lower arch.

"The simplicity of this appliance is not its only recommendation, as I feel sure that a trial will prove it to be of value for the purposes designed."

Dr. R. Wilder, *Cosmos*, 1894, page 831, before the Midwinter Dental Congress, read a paper on *Describing a Novel Appliance—Orthodontia*:

"The outer bands, constructed of spring gold, are divided in the middle and arranged with a suitable slide, so that the outer circle or band can be expanded or contracted, and fastened, making it capable of adjustment to any mouth.

The posterior teeth are used for anchorage always, and both expansion and contraction can be accomplished. In expanding, to prevent these teeth from collapsing a gold spring wire is used around the palatal surfaces and connected to the anchored teeth. The ball-and-socket attachment gives greater resistance where the anchorage is not sufficient, and by its use the posterior

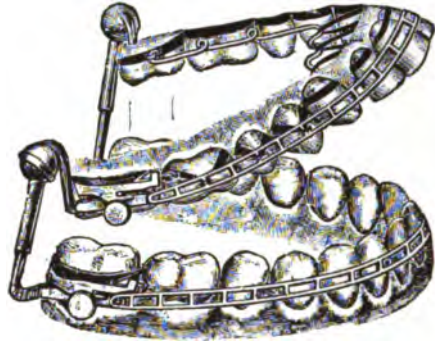


Fig. 12.

can be locked, and the lower made to move the upper teeth, and vice versa, without interfering with the labial movements. Teeth can be moved upward, down, backward or forward, outward or inward, or rotated without the use of bands; all the movements being produced with grass line or rubber thread (Fig. 12).

DOCTOR GILMER—THE SURGEON*

BY VILRAY P. BLAIR, A.M., F.A.C.S., ST. LOUIS, MO.

IT is with some diffidence that I take advantage of this invitation. This hesitancy is not due to lack of preparation, because for twenty years I have been a student of Dr. Gilmer and his teachings, nor because I am conscious of my inability to do justice to the occasion, for I will rely upon my love and esteem of the doctor to carry me where my skill in word painting will fail. My dilemma is this: For me to speak of him at all is to laud some quality or accomplishment, and he is of such modesty of thought that fulsome praise has ever been an embarrassment to him. However, I have been talking about him behind his back for twenty years and I might as well come out and say it before his face regardless of consequences.

The qualities that most endear him to us and have the greatest claim on our respects and admiration are those which typify the true gentleman and the scholar, qualities that have kindness for their motif and truth for their objective. None who have any acquaintance with him, intimates or otherwise, need to be reminded of these; good taste rather forbids our commenting on anything so innate and evident.

It is of another phase, his contributions to the science and practice of surgery, that I would speak to you and I presume to do this for two reasons: I believe my needs fitted me to appreciate these to a greater degree than those who have been less dependent upon his teaching, and because comparatively few, who have not made a special study of his contributions, have any appreciation of their number and originality or the greatness of their value.

My personal acquaintance with the doctor began at a time when I was much more sure of myself than I am today, the occasion being a talk of his which I was asked to discuss. Before this I knew him only by reputation, which, enviable as it is, you all know seldom does him justice. The subject of his discourse was leukoplakia, and in the course of his talk he stated in his attractively diffident, and somewhat hesitating way, that he believed the lesion was a late consequence of syphilis. The array of data which he had presented was disconcerting to the prospective commentator but this last was something that gave me an opening. Butlin had made no mention of any such idea and I had found it nowhere else, though I knew the "Erb's Scar" was recognized as postsyphilitic. When called upon I fear I took an attitude somewhat similar to the Vice Chancellor of Oxford who, when asked to discuss the motion to admit women to the University, opened the subject by saying he was against the proposed movement for several reasons, first and foremost, because it was something new. In an-

*Given at the Testimonial Banquet to Dr. Thomas L. Gilmer, D.D.S., M.D., Sc.D., by The Chicago Dental Society, Chicago, March 23, 1920.

swering me Dr. Gilmer simply reiterated his belief. Twenty years of clinical observation backed by subsequently devised laboratory methods have since convinced me of the probable truth of his purely clinical deduction.

The clearest presentation with which I am acquainted of the principles upon which depend displacements of the fragments in a fracture of the lower jaw is to be found in Gilmer's "Oral Surgery." The doctor has credited the principles to some one else, but I have failed to find an adequate prototype. With such a broad knowledge of the basic causes, it is but natural that he should possess a proportionate grasp of the principles and details of treatment.

Hippocrates is, as far as I know, the earliest recorded authority to call attention to the suitability of the teeth as fixation points in fracture of the body of the mandible, and the recognition that the upper jaw is an ideal splint for a fractured lower probably dates back quite as far, but for two thousand years surgeons had been treating this fracture by a nonelastic head bandage and a chin strap which we know gives about the same ultimate result as where no treatment had been used. It remained for Dr. Gilmer, a dentist practicing in a country town, to call attention to the simple and most useful procedure of wiring the lower teeth to those in the upper jaw which is today, in spite of the multitude of splints and devices at our disposal, the simplest and most universally applicable method of effective treatment. There may be those here who will be inclined to disagree with this latter statement. But, while no disparagement to or lack of appreciation of good splinting devices is intended, I am prepared to support my preference. The fractures of the lower jaw that can not be efficiently treated by the Gilmer wiring are relatively few; a somewhat extended observation has convinced me that the dentists who can make and properly apply a dental splint are not in the majority, while on the other hand even a surgeon could wire the lower to the upper jaw if he had ever been told how. Many modifications of the original plan have been suggested—some of them improvements, though these but add to the breadth of the principle.

When we turn to the matter of splints we find this master mind still leading the trail. As far as I can find out, Dr. Gilmer was the first to reassess plaster impressions of the displaced fragments of a fractured jaw which is the first step to properly constructing a splint. There is one widely known as Gilmer's posterior band or intra-dental splint which not only utilizes the dental attachment, a property common to almost all jaw splints, but also helps to relieve the strain on the not always firmly fixed teeth by directly splinting the bone fragments which is the foundation principle of most all other fracture splints. In again both simplicity and utility give this splint a very high rating.

In the treatment of the transverse fracture of the upper jaw I am not certain whether or not he first applied the reversed "Kingsley" splint, but he was at least one of the earliest and had worked out the plan independently.

It is ever his breadth of view that endows the manifestations of his mechanical concepts with the mechanical perfection which this work demands but controls by and made subservient to the broad principles of medicine and surgery.

True genius is, I think, not measured by one's ability to juggle with the

struse, but by the aptitude in adapting simple procedures to the solution of our every day problems.

One of the very useful devices in the dental bag of tricks is the soldered band cemented to a tooth which is so frequently used for fixation or traction. Strange as it may seem, this little device remained uninvented until Dr. Gilmer needed it to carry out some of his ideas; to devise it was therefore a perfectly natural thing for him to do.

Very lately, especially due to the opportunities afforded by the recent war, bone grafting to fill defects in the body and ramus of the lower jaw has been placed upon a firm basis, but before this the most practicable plan of compensating for the loss of a segment through the full thickness of this bone was a prosthesis that fitted into the gap against which the bone ends abutted. At least as a temporary expedient, it is still very useful. Dr. Gilmer was not the first to publish this plan, but he independently worked it out because, like the soldered band, he needed it to help him carry out his great object in life—to relieve his patients.

Speaking of war injuries and of splints reminds me of the device of the interlocking planes which allows the splinted jaw to open and shut but overcomes the tendency to a lateral deviation. This I knew was not a new device, but it was so useful in the treatment of war injuries and has been so frequently depicted in the reports of war cases that the majority came to regard it as a "war baby." It was with no surprise but with a distinct feeling of pride that I found this also we owe to our guest of the evening.

In times gone by it was a very much more common practice among good surgeons to remove one-half of the mandible for growths, even benign or only mildly malignant. Rarely was any restoration or retention apparatus applied, with the result that the body of the remaining half of the jaw, drawn past the midline by muscles and scar, was as useful to its owner as a paralyzed arm. It was Dr. Gilmer who first cried a warning against this promiscuous resection of the mandible for such neoplasms and pointed out that many of the tumors arising within the bone, even some of the sarcomata and alveolar carcinomata, could be enucleated or locally removed with little danger of recurrence. This warning has had a profound and beneficial effect upon the surgery of the jaws as practiced by well informed men.

Much as he regretted it, there occurred cases that required removal of half the mandible, but it was not for him to sit idly by and see a potentially useful half jaw rendered inert simply from its bad position. Such a jaw can be pushed back into place by inclined planes; but he discovered that if, immediately after the operation, the remaining part was wired in its normal occlusion and kept there for twenty-one days, it would retain both its position and its function without further mechanical help, a procedure the value of which many of my own patients can attest.

The pathologic anatomy of ranula has been a puzzle to many but he who is acquainted with Dr. Gilmer's writings will have various types clearly catalogued and will never confound ranula with obstruction of the submaxillary duct.

Dr. Gilmer pointed out the true mode of infection in periapical abscess and

was the first man I ever saw do a root amputation for its cure. That was quite a number of years ago and in spite of all that has been written and sometimes spoken quite audibly on this subject, I have yet to run across a single idea, either in technic or diagnosis, that has impressed me as a radical improvement on the methods he was using at that time. In fact, I doubt whether he has found reason to change his practice since then.

The repeated scraping out of pericemental pockets must be damaging to the remaining periodontal membrane, which when once destroyed is never renewed. Dr. Gilmer's practice of eliminating the pocket by amputating the non-useful and offending gum that forms the wall of the abscess as suggested by the elder Black has always appealed to me as a much more surgical procedure.

The Gilmer sharp steel probe is a little thing, the utility of which is now apt to be overlooked, but before the perfection of radiography of the bones it was the most apt means we had for locating and interpreting certain tumors and infections lying within the jaw bone, and still has a distinct place among diagnostic instruments.

The instances I have cited are but some of the contributions Dr. Gilmer has made to the practice of surgery. These and the many more I have not mentioned are but integral parts, cross sections as it were, of a scheme of practice that is truly great because it rests upon a profound knowledge of the physiology and pathology of the parts involved and a controlling sense of proportion.

The doctor has had a very large experience in operating upon odontomas and has given us not only an excellent classification, but has also clarified the diagnosis and the treatment.

I believe that Dr. Gilmer has the deepest knowledge and most wholesome appreciation of the pathology of the mouth of any one I know today. I know it to be a fact that many of the points that are being freely discussed today have been ticketed and filed in his mental card index for so long that he has almost ceased to mentally discuss them. Much of this was published by him in the seventies, eighties, and nineties. It was in the eighties that he wrote forcefully urging the dentists to associate the microscope with their practice.

It seems to me, it was a long time ago I attended a clinic given by Dr. Gilmer at an annual meeting of the Chicago Dental Society or some other local gathering. On Saint's Day that the doctor made the impressive, and for him, somewhat startling statement that he believed every dentist there present was responsible for the death of at least one patient a year by neglecting to clean up periapical infections. I am almost ashamed to confess, even now, that the idea was new to me but it impressed me so much that on my return home I wrote to him and asked if he really meant what he said. His reply was that he thought them to be responsible for the deaths of a great many more than one a year but did not like to say so. I went back to discuss it with him and he showed me the laboratory work he was doing, of the streptococcus he was almost invariably able to recover from these infected areas and root canals, all news to me and I think to most every one else at the time had they heard it, for it was long after this that I first heard the subject of focal infection being discussed in our dental and medical journals with anything of the exactitude that he then presented it to me. Be-

use of their vital importance and the clarity with which he presents them, I believe his contributions to the pathology and treatment of infections arising about the teeth to be by far the most important that he has made and today he is exerting influence, almost as valuable, to limit the excesses being practiced in the name of focal infection.

One of the greatest handicaps the dentist works under in treating infections of the lower jaw that have invaded the soft tissues is his hesitancy of approaching it by an external incision. The doctor's surgical instinct has freed him from any such embarrassment and it is very good surgical practice never to make an intraoral incision for infections that have invaded the floor of the mouth or the maxillary regions.

Probably one of the most talked-of diseases that the troops in the late war were subject to was the so-called "trench mouth" which, like a number of other things confronting the somewhat bewildered profession, seemed to be regarded as a new dispensation of providence or invention of the devil to further harrow the belligerents. It was not new and, from the German literature, at least, one could recognize it as an old enemy of the soldier both in barracks and in campaigns, but from these descriptions it was not easy to identify it as the gingivitis that created such havoc in the earlier periods of the late war and they offered little help in the treatment. However, to Dr. Gilmer's students, it has long been known by a different name—Gilmer's Gingivitis—because based on the sporadic cases occurring in his own practice he had recognized it as an entity and gave the first accurate description of its clinical characteristics and its effective treatment. Those who followed his teachings were not only previously acquainted with the lesion but went over knowing how to treat it, as was demonstrated by a number of them.

It is said in the Scriptures that "man can not live by bread alone," and it is equally true that one can not live by science alone either. To attain a position such as he has, one must have a goodly share of worldly wisdom too. The doctor is quite canny and has a fund of most excellent judgment from which in his generosity I have frequently profited—on one occasion, however, it came too late to save me from embarrassment.

Some years after he had introduced me to peridental infections I was at a very large meeting devoted to the subject of focal infections which by that time had become quite generally popular. A great deal of the discussion was by some of the more radical element who, it seemed to me, were inclined to substitute anti-septics for surgical judgment; they were carrying things pretty well with them. Without hesitation, I got up and protested their practices and teachings feeling quite safe and comfortable in the thought that Dr. Gilmer would back me up, and not ill pleased at the opportunity of introducing his view of the subject. They pinned me alive by sheer weight of numbers and he absolutely failed to come to my rescue. Later I rather reproachfully asked him whether he did not agree with me, and he said, "Yes, yes, you were right in what you said, but I think you were foolish to have said it there."

We hold a brief against the doctor for not writing even more, but those who know him best are ready to excuse him on this count, regret it as we may.

Devotion to his patients, a most delicate consideration of his confreres, a remarkable timidity about protruding his views, and an absolute lack of desire for self-aggrandizement, all contribute to his poverty of literary output compared with the wealth of material from which he could draw. If, however, he has fallen short in this regard he has more than compensated for it in another. As the dean, leading spirit and inspiration of one of the greatest dental schools, he has devoted more than a full share of his energy instilling his views of surgery, dentistry and right living into his students who all over this country, today and for years, have been proving his precepts in their practice. However as time goes on, the impression received at college becomes dulled and needs sharpened by repeated contact with the whet. I feel that, in spite of all he has done, Dr. Gilmer owes us, if not a complete text book on oral surgery, at least a monograph on the pathology of the mouth and essential structures. It would not necessarily be a large book, but what it contained would be the truth and that is what we very much need.

Members of the dental profession too frequently have cause to justly criticize the ruthless disregard by the surgeon of the knowledge and help that a dentist can offer him when operating about the mouth. On the other hand the surgeon not infrequently has occasion to feel that the dental viewpoint is somewhat hampered by a lack of working acquaintance with the broader principles of surgery. Regardless of the greater benefits that have resulted, certain drawbacks are incidental to dentistry having for a time shaken off the formal restrictions of the parental roof, and going forth to seek her fortune unhampered by the older surgical conventions. "It is not good for man to live alone," nor can any science reach its highest development independently. Dentistry has proved her case, but her very attainments have forced in both professions a recognition of the necessity of the closer union toward which we are tending. Dr. Gilmer is the ideal prototype of this union.

He has taken all that the Science of Dentistry could give him, and has given to dentistry in return in fair proportion to what he has received. At the same time he is thoroughly in touch with and guided by the broadest principles that underlie the practice of surgery and he has given to surgery more than he has received from it. You regard him as one of the great lights of the dental profession—I would acclaim him as a very great surgeon.

DEPARTMENT OF DENTAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

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THE CONTINUOUS ADMINISTRATION OF N₂O IN DENTAL SURGERY*

BY W. A. RAIL, M.R.C.S., L.R.C.P.

It was with considerable nervousness and hesitation that I acceded to the request of your secretary to read you this paper on N₂O in dental surgery, with particular reference to the continuous administration by the nasal method. In reading a paper on this subject before a gathering of dental surgeons, one must necessarily go over ground which has been well travelled by one's hearers, and therefore, should I put before you particulars with which you are already familiar, I can only ask your forbearance.

My hope is that on one or two points I shall be able to present this subject to you in a light in which you have not seen it before.

In administering N₂O gas the anesthetist has before him the purpose of obtaining a good surgical anesthesia with complete safety to the patient, while allowing the operator as long a time as he desires to complete his work.

At one time it was the universal practice amongst dentists to administer gas without the admixture of any air or oxygen, thus producing an anesthesia to the point of asphyxiation, when after the removal of the mask, the offending tooth, or perhaps teeth, could be extracted. This is the dangerous method, and 50 per cent or more of the fatalities under gas have been caused by this practice of administering gas without air or oxygen. After anesthesia by pure gas one can hope for a maximum operative period of about 60 seconds, and this is considerably shortened in most cases; whilst in the case of alcoholics and other types of cases one obtains a very transient anesthesia with a comparatively great risk of fatality.

This method is now out of date, and I will not consider it further.

To administer gas in safety about 8 per cent of oxygen, or 40 per cent of

*A paper read before the Dental Society of the Cape Province, South Africa. Published in the South African Medical Record, April 24, 1920.

air by volume, should be mixed with the gas. For surgical operations it is better to use pure oxygen than air, by this means eliminating the 32 volumes of nitrogen gas which is contained in the 40 volumes of air, and obtaining a tranquil anesthesia; but for dental operations air answers the purpose perfectly well, while making the apparatus less bulky and cumbersome.

Considerations of the above nature led Paterson to begin the practice of allowing the patient to breathe a small quantity of oxygen with the gas in order to eliminate from the administration of gas those dangers which have previously limited its use. His methods were quickly taken up, and it was found that N_2O , with the admission of the correct amount of oxygen or air, produced an anesthesia which in most cases could be prolonged for a time sufficient for the performance of any dental operation. The classical case recorded lasted for over 30 minutes, and stopped then only because the operation was finished. Not only was this the case, but it was noticed that the after effects of the continuous anesthetic were at least as slight as those of gas administered by the old method.

There are many forms of apparatus in use at the present day, and they all have the same essentials. I have the apparatus I use here tonight, and any one who wishes to can see it. Instead of the ordinary face-piece covering the mouth and nose, this apparatus has separate mouth and nose pieces, joined together by a patent rubber tube. In the nose-piece there is a valve which can be opened to admit air. The gas, after passing through the bag, flows into the mouth-piece and then along the connecting tube into the mouth. If desired, the bag and tube with a graduated valve can be attached to this apparatus, and the desired mixture of pure oxygen and gas can be administered. Although a more even and slightly deeper anesthesia is obtained by the use of oxygen instead of air with N_2O gas, in my opinion it is not necessary in the anesthesia required for dental surgery; and the high cost of oxygen in this country, together with the increased bulk of the combined apparatus, prohibits the use of gas and oxygen, as opposed to gas and air, in dental work. As I have said before, N_2O combined with air gives a very satisfactory dental anesthesia.

Of all anesthetics N_2O with air is the most difficult to give successfully, for this reason: that the signs of anesthesia, when the anesthetic is well given, are at first very faint and difficult to perceive. As the anesthesia is produced, the signs may become more pronounced, but if the anesthetist waits until the signs are so, he will have wasted many seconds of the operator's time. Cyanosis and jactitation—the results of too little air—must be avoided, and these were two of the principal signs in the old method of administration. Cyanosis is dangerous, and a little air given when necessary will obviate this danger. By the new method of giving gas an anesthesia of suffocation was produced, so that cyanosis was always present. The admission of oxygen produces true anesthesia, and to get cyanosis is a sign of a badly given anesthetic.

Jactitation, also a sign of suffocation, must be avoided, and especially in anesthetizing a pregnant woman.

Struggling, at the beginning or during the administration, means that the patient is getting too much air or oxygen.

Stertor is your principal sign. It may be so faint that you can not hear it, but a finger placed lightly on the pomum Adami will tell you when stertor begins, and will distinguish between false and true stertor. Again, it is frequently absent. Automatic respiration, slightly rapid sluggish, pupillary reflex, and twitching of the orbicularis palpebrarum muscles will also act as guides, and it is on these that you must depend when stertor is absent.

I know that all these signs may be found on reference to any text book, but I repeat them to emphasize that fact that, in a good anesthesia by gas with ether or oxygen, cyanosis and jactitation, and very likely stertor, will be absent, and it is on very little evidence, seemingly, that the anesthetic will tell the operator that he may begin.

As with all anesthetics, there must be some amount of preparation. If the operation can take place between 9 and 11 a.m., abstention from breakfast will suffice, but the patient should take an early cup of tea with a rusk or biscuit. For operations later in the day, the patient must have had no food for some four hours previously. I am not in favor of a severe purgative the day before; it is too depressing and relaxing.

Nitrous oxide by itself is of little use to dentists owing to the shortness of the anesthesia. N_2O with air or oxygen, nasally administered, will give a sufficiently deep anesthesia with complete relaxation for all dental operations, and can be prolonged until the operation is finished in suitable cases; and the great majority of cases are suitable for this anesthetic. Why, then, should a powerful anesthetic like $CHCl_3$ be used, say, for a full clearance, when the same can be done with less trouble to all parties concerned, and with practically no risk to the patient, by the use of continuous gas in the dental chair?

In comparison with other anesthetics N_2O with air or O_2 for dental purposes stands alone, but there are certain contraindications and difficulties which I will mention after I have described what I consider to be the best and safest methods of giving N_2O . Let me now say that at present the cost of gas in this country is almost prohibitive to its extensive use, but I believe that Messrs. Petersen, Ltd., are about to undertake its production at their Johannesburg branch. For some reason the climatic conditions of South Africa make good N_2O anesthesia less easy to obtain than in England.

The best method of administration of gas for any purpose whatsoever is that by means of which you can control any emergency that can possibly arise. If you use any modification of Teter's apparatus, where you can pass your gas and O_2 over warmed ether or C. and E. mixture at will, you have an anesthetic with which you can control your patient for any surgical operation, major or minor. Should it be possible for an anesthetist to have a room, properly fitted where all gas cases could be brought to him and attended to by their own dentists, this form of apparatus could be used and perfect anesthetics result. But the apparatus is too bulky to be carried from surgery to surgery. Using the easily portable form of apparatus before described, I give my dental anesthetics as follows:—

A small prop is placed as far back as necessary in the mouth. The nose and mouth-pieces applied must fit accurately; there must be no leakage. Should

the cheeks be sunken, a pad of cloth can be applied and a slight positive pressure can be kept up in the bag. The patient is made to inhale gas for some breaths, expiring through the valves, then she is given a breath of air. After taking another eight breaths or so of gas, she is given another breath of air. This is continued, judging the amount of air required by the color of the patient. Should her breathing be shallow, allow her to rebreathe until the respirations are deeper, and you will notice that they become quicker and more automatic as the patient approaches anesthesia. You will see that the muscles relax, perhaps the face muscles may twitch and the pupils dilate slightly with the sluggishness of or absence of conjunctival reflex; and you may see or feel stertor. One or more of these signs may be present, and the patient will be anesthetized and ready for operation. The time necessary for the induction of anesthesia may be from two to ten minutes, or even longer, but generally is between two to four minutes. Now remove your mouth-piece, and the operator can begin. Keeping your hand on the firmly applied nose-piece, you can admit air or gas as necessary, cause the patient to rebreathe or to expire through the valve at will, and in most cases, particularly in women and children, anesthesia can be prolonged to the end of the operation.

Some authorities suggest that the rebreathing be started at the commencement, giving alternate periods of eight breaths into the bag and out through the valve. This is good, especially in the case of men, as it deepens the respirations and more quickly anesthetizes this, the most difficult type of gas patient. It saves gas also, to the anesthetist an important consideration.

On the insertion of the prop some patients are liable to gagging or retching. If necessary, one can do without a prop and insert a gag at the beginning of the operation.

During the administration pallor must be carefully treated, and the anesthetic may have to be stopped if this sign can not be relieved. Sudden pallor in the young is often a warning of syncope.

There is one thing I have noticed, and that is the occurrence of sweating associated with pallor in the case of young men, who all admit to a history of rather heavy smoking, with the use of a certain amount of alcohol. In such cases it is better to give a little ether, or sometimes to stop the anesthetic altogether, rather than to run the risk of continuing.

Cyanosis in the elderly needs plenty of air, but I see no reason for giving gas to old and stout people. Should an anesthetic be necessary, it is better to give CHCl_3 in most cases of this class.

For children, when deciduous or early permanent teeth are to be extracted, gas with air is not so good as ethyl chloride. Given without a bag by a slightly open method, the quick results of E.C., the pleasant smell, and the deep anesthesia obtained for a time sufficiently long for the work in hand, make it a much more pleasant anesthetic for children up to the ages of 10 or 12.

In older people E.C. can be used if the operator is sure of the amount of time he requires, but where this can not be gauged, say in the attempted extraction of a difficult lower wisdom tooth, it is always better to have continuous gas given to be on the safe side.

For old people, alcoholics, fat people, and people whose arteries are scler-

as with air or O_2 is not a good anesthetic. These patients go under very slowly, and the gas must be pushed, very often to a considerable degree of cyanosis, to keep them properly insensitive. The blood pressure rises considerably; and at times it is difficult to produce, much less prolong, anesthesia at all. In cases of this description there is considerable danger, and I prefer to administer HCl_3 or ether when an anesthetic is needed.

I have found that the best type of patient for gas anesthesia is the fair, nervous woman between the ages of fifteen and forty-five. All normal women of this period of life take gas well, but you will find that, when giving gas to women in the second period of life, you will occasionally find it necessary to have recourse to your ether bottle in order to bring about a satisfactory degree of anesthesia. And this patient is almost invariably dark-complexioned.

When dealing with men, your first question is whether the subject takes alcohol or not. If he has a history of abstinence from, or of great moderation in, alcohol, then you will get a result similar to that of a woman of the same class; but should your patient be accustomed to alcohol, say even to the extent of two or three whiskies a day, then you will not easily induce anesthesia with gas, nor will you be certain as to whether you will be able to continue the anesthesia or not.

In these cases I usually induce by means of gas through a bag attached to Clover's inhaler, so that I can use ether as well if required. If I find that gas alone is required, it is easy to change to the nasal apparatus. But as a rule, for a long anesthesia in this class of case, one needs to pass one's gas over the surface of ether or C. and E. Mixture. I am now referring to men between the ages of 30 and 50. Men and boys under 30 usually respond very well to continuous gas. To men over 50 I give gas as seldom as possible. I think it dangerous to use this anesthetic in these cases. You can not be sure of the condition of any man's arteries, and most men of today are moderate or immoderate drinkers. As I have mentioned before, a modified form of Teter's apparatus is the best, and one could be installed very easily in the extraction room of every dentist, when the anesthetist's work would be greatly eased; or, an extraction room common to all dentists engaging the same anesthetist could be arranged, where the dentists could bring and work on their own patients, leaving the after treatment to the anesthetist, thus saving the time of both dentists and anesthetists. This is done to my knowledge in at least one city in South Africa.

One of the greatest impediments to successful nasal anesthesia is habitual mouth-breathing. Should the nasal passages be partially blocked, then the anesthesia will not be continuous but intermittent, as the operator will have to stop from time to time to allow of the re-application of the mouth-piece. One of the commonest causes of mouth-breathing is the dentist himself. In extracting lower teeth it is the common practice of the operator to depress the tongue with his fingers, thus making an airway through which the patient breathes. Normally, the upper surface of the back of the tongue touches the soft palate, completely closing the airway. If you depress the tongue you draw it forward, and an airway is opened; the patient uses it and returns to consciousness. The anesthetist is blamed for a poor anesthesia when it is hardly his fault. I have

worked with dentists who realized this, and always obtain my best results from these men.

As I have said before, old and stout people, and people in which arterial degeneration is suspected should not be given gas.

Valvular disease of the heart, properly compensated, is no reason for withholding of continuous gas. There is no danger provided that the heart is compensating properly, and that sufficient air to avoid cyanosis is given.

Continuous gas can be given with perfect safety to pregnant women. In fact, it is preferable to a local anesthetic in dental work in that it avoids the shock of the extraction and the after-pain of the local injection. Again, sufficient air, but not too much, must be given, and all cyanosis and jactitation, struggling and excitement must be avoided.

Patients suffering from large goiter, enlarged glands, or any neck condition likely to cause difficulty of breathing, should not be given gas, but in this class of case continuous gas is not at all dangerous, as compared with gas given by the old method. The avoidance of cyanosis and congestion by the admission of air does away with the fear of undue pressure on the trachea. This is not a desirable class of case for gas anesthesia.

In the course of hospital work one has to give gas to all-comers, but in this class of case, and when working on oldish men, the rigidity of whose arteries was unmistakable, I would have preferred to use a general anesthetic.

You will see, then, that there is no reason for not using, in fact, I maintain there is every reason for using, continuous gas for dental anesthetic purposes.

(1) Nitrous oxide is by far the safest anesthetic.

(2) It can be given to all normal people, particularly between the ages of ten and fifty.

(3) It gives a long anesthesia, and in this way and by reason of its safety is greatly superior to ethyl chloride, which latter is less safe when given continuously.

(4) It is given in the sitting-up position in the dental chair, and the patient is ready to go home a few minutes after he has recovered from the anesthesia.

(5) It saves the dentist much time when used instead of either a general anesthetic or a local injection for a number of teeth.

(6) It has no after-effects. Headache, vomiting and sickness are practically unknown, and the after-pain of injections is avoided.

DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Under the Editorial Supervision of

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It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

DENTAL RADIOGRAPHIC PATHOLOGY

WITH THE PRESENTATION OF INTERESTING CASES

DR. GEORGE PALMER RATNER, NEW YORK, N. Y.

RADIOGRAPHY in the last few years has established itself so firmly as a diagnostic agent in the practice of dentistry that the writer will endeavor through the presentation of the following cases to show that dental radiography must be practiced as a specialty to attain the proper radiograms and correct interpretations.

It was a great surprise to hear certain reputable men state at a dental convention held at the Hotel Commodore in New York recently, that there was no justification for specialization in dental radiography, and that a diagnosis given by one specializing in this branch of dentistry should not be accepted.

The contention appeared to be that unless the general dental practitioner takes the radiogram personally and knows the clinical history, radiography can not be practiced correctly. This argument if it is what the writer understood it to be, can conclusively be proved weak, since in the majority of cases presented that came under my observation, it will be noted that the patients went through the hands of general dental practitioners who radiographed them without disclosing the findings correctly. It was evident that the general dental practitioner failed in his radiography because of doubtful and inconsistent technic, which inevitably results in an erroneous finding and interpretation.

I desire to state emphatically, so as not to be misconstrued, that clinical history is of paramount importance in rendering of an interpretation of a radiogram.

In radiography there are three primary technical factors involved; *first*, position and style of negative to be used; *second*, exposure, which includes consistency of tube; *third*, the development of negative. It is becoming increasingly evident that radiography has reached the stage of an exact science requir-

ing the development of a carefully laid out technic and any deviation from the fixed technic will inevitably result in an improper radiogram resulting in incorrect interpretation. The general dental practitioner has so many duties to perform in his endeavors to conserve the teeth that consistency of technic is usually lost or this feature of the work is assigned to a technician who works more or less mechanically.

To be able to interpret any radiogram, one must know definitely the anatomy of the parts involved and the various type shadows these parts present upon the negative when exposed. It so happens that the general dental practitioner does not come across as great a variety of dental pathology in his own practice as the radiographic specialist, and therefore he can not acquire so keen a diagnostic ability since he is confined to a narrower and more limited field of work.

The general dental practitioner should recognize this fact and be guided by the opinion of the radiographic specialist, but should only accept his verdict if the clinical findings substantiate the radiographic ones. After all radiography is a means of diagnosis and the nearest one we have to a positive one.

Two common fallacies in interpretation often brought to my attention are: first, the antrum shadow created over the apices of the molar teeth which was diagnosed as a cyst or infection, about these teeth: second, the shadow of the mental foramen sometimes situated close to the apices of the inferior premolars diagnosed as an apical focal infection about one of these teeth.

Usually when the general practitioner takes a radiogram he confines his work to the No. 1 film and herein is a false procedure in technic. Cases will be shown where it was impossible to disclose the pathologic condition present due to the limited area exposed upon this small negative.

In the complete radiographic examination of the oral cavity in a large number of patients, it was rare to find a perfectly healthy condition, especially where dental restorations or corrections were performed. Since so many constitutional disturbances have been traced to the teeth and adjacent tissues it is only a question of time when the mouth must become a gauge to the individual's health. It seems certain that in the very near future, when a physician makes a physical examination of a patient, he will insist upon a radiographic one of the teeth and the adjacent tissues to determine the existence of any pathologic conditions, the same as he insists upon the examination of the urine for the determination of the presence of sugar or of the blood in a Wassermann test, in order to eliminate as soon as possible this source as a possible cause of a constitutional reaction.

Obscure cases which have resisted the efforts of all medical aid were readily treated by the discovery of the fact that the etiological factor lay hidden away about the oral cavity. Constitutional disturbances, resulting in rheumatoid arthritis, endocarditis, and gastrointestinal conditions, have so often been traced to the teeth, where foci of infections were disclosed about the apices or adjacent tissues, that an earlier radiographic examination as a preventive measure, would have gone a great way in forestalling such ailments as ultimately befell the individuals.

In a timely and interesting article entitled "The Relation of Oral Infection to Mental Disease," which appeared in the *Journal of Dental Research* of D

ember, 1920, Dr. Cotton, of New Jersey State Hospital, Trenton, N. J., has shown that by the correction of certain dental pathologic conditions existing in the oral cavity a great percentage of cures has resulted.

It is not my contention that all ills and ailments can be attributed to the teeth, but after the elimination of all possible causes it has been found that where a pathologic condition existed about the oral cavity the correction of it very often leads to a complete cure.

Before entering upon the discussion of various cases, a word is timely relative to the commercial x-ray laboratories. In the last few years these laboratories have come into existence and I believe no greater form of quackery has arisen, both for the medical and dental professions and also for the laity, and not until the professions as a whole unite, can this evil be curbed. A great many cases have been referred back to me for radiographic confirmation of the findings



Fig. 1.

by these laboratories, and it is my belief that through the "promiscuous x-raying" of the teeth and the unscientific interpretations given to the profession, and diagnosis to the laity upon their request, many individuals are unnecessarily losing teeth, which in the hands of conscientious and skillful dentists could be conserved.

The citations of the following cases are from private practice and some are taken from the Vanderbilt Clinic where I spent some time as a radiographer, and where it was possible to ascertain clinical results or operations performed, they are described.

The form of examination in all cases is clinical history and radiographic interpretation. At no time do I feel that the radiographer should give a prognosis, course of treatment, or results from a radiographic examination, because this is beyond his field of operation and should be left entirely to the dentist's judgment.

CASE I.—Clinical History.—Patient, male forty-three years old, suffering

from chronic suppuration in the mandibular left third molar region. Operated upon for this condition twice, but no permanent cure resulted. Patient was told that both the second and third molars were removed. Radiogram taken on small dental film did not disclose any definite cause for this suppuration. Entire area anterior to third molar region necrosed and infected.

Radiographic Interpretation.—Entire left side of mandible taken on an 8x10 plate discloses fully developed third molar embedded in the ramus at the angle of the jaw. Area anterior to this impacted tooth and up to the second molar necrosed and infected. (Fig. 1.)

Clinical Result.—Fully developed third molar removed, area curetted. After several weeks complete recovery took place and permanent cure resulted.

Note.—Patient was radiographed previously but all radiograms being confined to small dental films, the etiologic factor was not ascertained.

CASE II.—Clinical History.—Patient, female. After an extraction of a mandibular left first molar severe neuralgic pains developed. This pain which be-



Fig. 2.

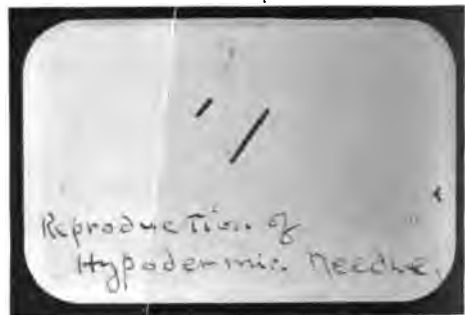


Fig. 3.

came worse for the last three years, developed into characteristic douloureux. Pain had a tendency to localize in certain teeth, and patient had these teeth extracted periodically, six were removed through this procedure hoping to relieve the condition, but without any success. Alcohol and ether injection gave temporary relief. As a last resort sought the aid of a surgeon who suggested the resection of the gasserian ganglia. The patient went to several prominent neurologists, physicians and dentists for this condition and it appears at no time was a radiographic examination of the teeth or oral cavity suggested. In examining the oral cavity all the teeth with the exception of an inferior molar which had a filling were normal, and gums healthy. Complete radiographic examination of the oral cavity made.

Radiographic Interpretation.—In the mandibular left first molar area a foreign body was present, which appeared to be a hypodermic needle about half an inch in length, situated perpendicular to the mandibular canal and penetrating the nerve. At first it was suspected that the needle was external to the alveolar process in the soft tissues, but was found to be between the alveolar plates of process. (Figs. 2 and 3.)

Clinical Treatment.—Dissection of the soft tissues external to the alveolar

process did not disclose any needle, but situated between the external and internal plates there was found a corroded needle about three-quarters of an inch length which was broken in the removal of same. It appears that the needle was broken at the hub during the administration of losal anesthetic for extraction.

Note.—This case is of extreme importance in that the patient was about to be operated on for the resection of the gasserian ganglia. At no previous time was a radiographic examination suggested of the oral cavity. In all neuralgic disturbances about the head and teeth, the examination of these parts radiographically is of paramount importance before any other procedure is suggested.

CASE III.—Clinical History.—Patient, male, 38 years. Small area present in the palatal region above central teeth, which upon probing disclosed a large cavity. All teeth in the maxillary arch normal and vital to all appearance. Patient gives history of three-plus Wassermann reaction.



Fig. 4.



Fig. 5.

Radiographic Interpretation.—Large area of necrosis present about the center of the palate, teeth normal, small filling in central made to test vitality of this tooth which was suspected as devitalized. Diagnosis large area of necrosis. Specific origin, tertiary lesion, gumma of palate. (Fig. 4.)

CASE IV.—Clinical History.—Patient, 33 years. Chronic pus discharge from the palatal region above central teeth. Right lateral and central teeth crowned.

Radiographic Interpretation.—Large cyst formation above centrals and lateral teeth present. All crowned teeth disclose poorly filled canals. These teeth were the cause of this large area of necrosis and infection. (Fig. 5.)

Note.—These cases are presented together since the clinical manifestations were similar in reaction as determined radiographically, but having two different etiologic factors. Case III, which was due to a specific condition, could not be corrected without proper medication under a physician's supervision. Case IV

which was due to poor dental operations about the teeth was corrected by removal of the diseased teeth and curetting the area, resulting in complete regeneration. In the specific necrosis the ravages of the disease were corrected by proper medication, but the destruction of bone was permanent and permanent had to be closed by a mechanical appliance.

CASE V.—Patient, female, thirty years old, suffered from severe headache for several years. Examination of oral cavity disclosed the absence of any third molars superior or inferior. No history of any eruption or extraction of third molars. Patient had one third molar area radiograph (Fig. 6) and an unerupted third molar was disclosed. Several weeks later patient came back for a complete mouth examination to determine whether any other third molars were present.

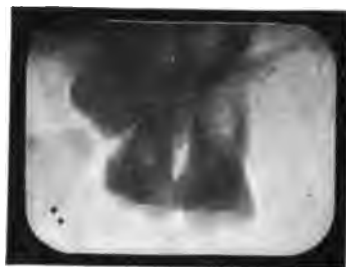


Fig. 6.



Fig. 7.

Fig. 8.

Fig. 9.

Radiographic Interpretation.—Fig. 6. Maxillary left third molar unerupted and impacted against second molar.

Fig. 7. Mandibular left third molar unerupted and impacted against second molar.

Fig. 8. Maxillary right third molar unerupted and impacted against second molar.

Fig. 9. Mandibular right third molar unerupted and impacted, in the region of the mandible close to the mandibular nerve.

Note.—In all disturbances about the head and teeth it is important that the oral cavity be considered as a unit of study. This case disclosed four impacted third molars of different types in one individual.

CASE VI.—Patient, male, nineteen years old. Swelling of the chin present. About three years ago had similar swelling opened by physician and at the time it took several weeks to heal. At present, swelling large and area inflamed,



Fig. 10.



Fig. 11.

right lateral appears discolored. No radiogram was taken previously to one.

Radiographic Interpretation.—A cyst formation situated in the region medium line below the mandibular incisors. The right lateral is a devitalized tooth. (Fig. 10.)

Clinical Result.—Devitalized right lateral tooth treated, and entire abscess necrosis curetted. After several weeks permanent cure took place.



Fig. 12.

Note.—This case as originally treated by a physician resulted in a temporary cure, but the origin was dental. In all obscure cases of this nature there must be closer cooperation between the dentist and physician.

CASE VII.—Clinical History.—Male, thirty-nine years old. Last three years previously to being radiographed, suffered from chronic swelling of the parotid gland on the left side. During this period had incision of the gland made to evacuate pus which accumulated, but no permanent relief from the treatments. Several dental films were taken and it was decided that mandibular

first molar was the cause of this trouble. The dentist refused to extract this tooth because there were no symptoms of its being devitalized, and he referred patient for a more complete radiographic examination. Plates of this side of the mandible were taken.

Radiographic Interpretation.—Film discloses mandibular left first molar normal. Plates (Fig. 11 mouth in closed position) disclose a mass about the size of a sweet pea, having the same density as tooth structure or bone, situated beneath the apices of the second molar and slightly below the path of the mandibular nerve. Fig. 12 discloses same mass situated beneath the apices of the second molar but more in the path of the mandibular nerve. Diagnosis, salivary calculus (stone) in the submaxillary gland. This stone probably obstructed the duct causing retention of fluid from this gland and interfering with the function of the gland, producing ranula.

Note.—Radiograms taken were confined to small films, and tooth diagnosed



Fig. 13.

cause was normal. Entire gland was enucleated and salivary stone found herein.

CASE VIII.—Patient, female, nurse. Suffering from severe headaches for the last eighteen years. Sought the aid of any number of specialists and received various treatments but at no time did patient become relieved from these severe headaches. Wore a full upper plate; the mandibular incisors and canine present. Her dentist radiographed the mandibular teeth, but did not bother about the upper jaw because the patient wore a plate, and the gums appeared healthy.

Radiographic Interpretation.—Mandibular teeth normal. In the maxilla on the left side, embedded in the alveolar process, near the alveolar ridge, there was present a fully developed canine tooth. (Fig. 13.)

Clinical Treatment.—Permanent tooth removed. Six months later headaches had lessened to a marked degree and the patient said, "I think we have struck the cause."

It is a false procedure at any time to take for granted any supposition as regards the normality of a part unless definitely known. In this particular case, because the patient wore a full upper plate, the maxilla was not radiographed,

and the cause was not found. The oral cavity must be considered as a unit as a sectional part, for a complete diagnosis.

CASE IX.—Clinical History.—Patient, female, twenty-seven years old. 9 months pregnant. Developed growth above the canine region on the gum the size of a hazel nut. Very vascular, and least irritation causes bleeding. G



Fig. 14.



Fig. 15.



Fig. 16.

appeared benign since size remained constant for the last three months. It appeared to be no root present, lateral normal, canine recently extracted.

Radiographic Interpretation.—Fig. 14. Alveolar process is not regular, a small spine-like process present, which is probably the septum of bone between the canine and lateral incisor. Fig. 15 shows the size of the epulis with

attachment to this irregular, spine-like process. Diagnosis, epulis due to irritation from this irregular process.

Clinical Treatment.—Radical removal including the lateral tooth for the prevention of a recurrence of same.



Fig. 17.

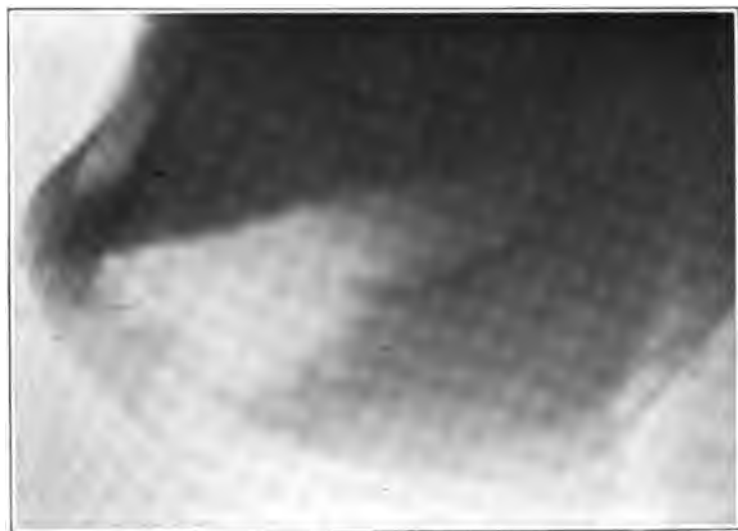


Fig. 18.

Note.—These growths known as benign epulis occur frequently in premenstrual women, probably due to some change in metabolism during this period. To determine as to whether the growth is benign or malignant in character, a biopsy section should be made and examined microscopically by a pathologist before operating. At no time should a growth about the oral cavity be neglected, as it may become malignant in time. The etiology of an epulis usually lies in local irritation as a root, shell crown, bridgework or as in this case of inflamed alveolar process.

CASE X.—Clinical History.—This case is presented because of the possibility of an error in interpretation due to a defective film or artifact in a radiograph. The upper film was taken and when developed both films disclosed what appeared to be an unerupted second premolar tooth or malformed tooth about the canine area. The second film taken immediately afterwards and confirmed



Fig. 19.

several more did not disclose any similar condition, and upon close examination of the first negative it appears that there was a decided defect in both films. There was present a second premolar root only. (Fig. 16.)

Note.—In determining any abnormal condition that may occur, at no time should one negative be relied upon, but several should be taken, and at different angles.

CASE XI.—Patient, female, twenty-eight years old. Mandibular right second premolar and molars removed, because of large swelling and apical alveolar abscesses. Suppuration from this area for several weeks previously to being radiographed. Recovery very slow after extractions.

Radiographic Interpretation.—Fig. 17. Entire area from the mandible from second premolar to third molar region disclosed that the entire body of the mandible on this side was necrosed and infected, extending to the inferior border of the jaw. Diagnosis, pathologic fracture of the inferior mandible due to necrosis.

Fig. 18 is same area radiographed six months later showing marked bone regeneration taking place.

Note.—In order to ascertain whether bone regeneration of any given area has taken place, a number of radiograms should be taken periodically, and by a comparative study, note the difference in bone structure.

CASE XII.—*Clinical History.*—Patient, fifty-five years old. Entire left side discloses large growth in the oral cavity and mucous membrane from the mandibular left canine ulcerated and broken down. Probing the bone in this region showed it to be necrosed. Very foul odor present. Glands swollen. Suspected carcinoma present and appeared very malignant because of rapid growth in the last few weeks.

Radiographic Interpretation.—Entire area from the canine to third molar discloses body of the jaw broken down and a necrosed mass. (Fig. 19.) Diagnosis, carcinoma of the mandible. Inoperable.

Clinical findings of growth was carcinoma, epithelioma variety, malignant.

Note.—In all growths about the oral cavity a small section should be made and sent to a pathologist for further examination microscopically and determine as to its malignancy. This case was too far gone for an operation, because of its malignancy and metastatic involvement, manifested by the glandular enlargement. Patient died six weeks later.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

The Dental Dysplasia of Capdepont. Fargin-Fayolle. *Revue Belge de Stomatologie*, 1920, xviii, No. 1.

The first cases of this affection were described by Capdepont in 1905 and years later the author saw his own first cases and confirmed the discovery. A third stomatologist, Schaefer, has also described cases and as far as known have been no other reports published. The affection is a general dental dysplasia expressed clinically by a vulnerability and friability of the tissues not encountered in the same degree in any other dental affection. Histologically all three of the connective tissues of the teeth are involved, with predominance of the interstitial tissue. Pathogenetically the affection is a cytological lesion of the adamantoblasts, especially of the odontoblasts. It affects both dentitions and shows a familial incidence. The number, volume, implantation and direction of the teeth are unfavorably influenced. The free portion of the teeth is worn away in various degrees—perhaps only the cuspids are worn off, perhaps the entire crown is lost to the gums. The teeth have a barley-sugar color and appear slightly translucent. They are but slightly sensitive to heat and acids. All of the teeth are not uniformly affected, and some of them seem to have some relative immunity. The eruption of both dentures is delayed. The underlying process appears to be of the nature of an intoxication—the same process which underlies all dystrophies. The nature of this intoxication we can only surmise as akin to the autotoxemia of pregnancy and closely related to normal metabolism. The morbid substance, whatever its nature, appears to have a specific or tropic action on the odontoblasts. The metabolic anomaly may be transmitted along two generations. Capdepont saw it in three successive generations while on two occasions he attacked two brothers.

General Predisposing Causes of Caries. Patrone. *La Odontologia*, 1920, xxvii, Nos. 11-12.

The author through authorization by the National Council of Education of Argentina has examined the teeth of 2045 Buenos Aires school children. The age limits of the subjects were six to fourteen years. He found the enormous number of 1893 to be suffering with caries, or in other words only about 8 per

were free from that affection. For control purposes he then examined 1186 children in the city of Mar del Plata and encountered the surprising fact that only about one-half were subject to caries. But it is of interest to know that in 1910 a survey of the children of Mar del Plata showed but 32 per cent with caries, so that the latter appears to be on the increase. This town is small in comparison with the capital city, with low buildings and excellent outdoor ventilation. In the different incidence of caries in these two localities may lie the secret of the predisposing causes. A survey of the teeth of school children of Italy has shown the same disparity of caries in rural as in urban life. This was abundantly shown by Piperno during the late war in an examination of recruits. In other words caries is a disease of culture and of civilization. This is the more remarkable because the rural dweller does not care for his teeth, while in the city many do practice a hygiene of the teeth. The purity of the air is of course insufficient to explain the relative infrequency of caries in rural neighborhoods and the author is therefore thrown back to the vitamine theory and the belief that caries is a sort of deficiency disease. No hard and fast line can be drawn, for a defective diet is possible among the peasantry as well as the city slum dwellers.

Present State of the Treatment of Inoperable Cancer of the Tongue. Solomon. *Zahnaerztliche Rundschau*, 1920, xxix, No. 7.

The day has gone by when these unfortunate victims are cared for solely by morphine injections. Cancer of the tongue is especially common in Austria, or rather among Austrian men, for women are seldom attacked. Hence the lesion has always been brought into causal association with the masculine habits of smoking and drinking. But in certain other countries where these vices obtain women do not enjoy as much immunity, so that another factor must be thought of. In Austria the man over 70 begins to escape the toll of the disease while up to the age of 40 he is also relatively immune. "One time injury" was once accused but more recent studies have thrown doubt on this factor which at most acts as an auxiliary when the disease is already present. Chronic irritation is a more active factor and leucoplakia precedes about one lingual cancer in three. But leucoplakia may itself be the first stage of the disease. The chief resource in inoperable cancer of the tongue is radiation but as is too well known this not only falls short in a large number of cases but may in one way or another aggravate the lesion. The method of Keating-Hart or fulguration is specially recommended by its inventor for cancer of the tongue and Czerny has employed it with benefit in association with radium. Electrocoagulation has been tested with benefit by Nagelschmidt and several others. Thermopenetration or diathermia has been successfully combined with the x-ray by Pfahler and Muller, and the author himself has an excellent result attributable to electrocoagulation, he having used the technic of the late Doyen.

Case of Hutchinson's Teeth. Guilly. *Revue de Stomatologie*, 1920, xxii, No. 1.

The patient was a girl aged nineteen years, referred to the dental service of the Broca Hospital. Nothing could be learned of her parentage as she had been

abandoned at the age of two years. The stepmother states that she was well to the age of nine, when a discharge from the left ear was present for several months. She continued in good health until fourteen, when visual disturbance began, and soon afterwards she went blind. The author found Hutchinsonian teeth. The eye clinic reported bilateral atrophy of the optic nerve, peripapillary retinochoroiditis, nystagmus and divergent strabismus of the right eye. There was a positive Wassermann. Patient received injections of salvarsan until the reaction went negative, and afterward, thirty-three in all, with further injections of mercury cyanate and gray oil. The general condition was then excellent. No impression had been made on the blindness. The face and cavity of the mouth aside from the teeth and possible shape of the palate showed nothing abnormal and the author was inclined to reject the first impression that the palate formed a ogival. The upper denture was complete save the wisdom teeth. There was persistence on the left of the temporary canine, with displacement of the permanent tooth. Of all the upper teeth only the central incisors showed dysplasia; these agreed with the so-called Hutchinson's teeth. The lower jaw showed absence of wisdom teeth and persistence of two temporary molars; there was dysplasia unless one could reckon a slight conical shape of the central incisors. The x-ray confirmed the ordinary diagnosis. It should be added that the permanent premolars were absent. There was no trace of the tubercle of the nose. The loss of vision suggests an approaching tabes dorsalis but of this there is no other sign.

Teeth Which are Traversed or Furrowed by the Inferior Dental Nerve Rodier. *Revue de Stomatologie*, 1920, xxii, Nos. 1-2.

The author contributes an elaborate study of this subject which resulted in the publication of two cases in 1909 of wisdom teeth traversed by the inferior dental nerve. The author who reported one of these cases has since borne the subject carefully in mind and up to 1914 had come upon a number of analogous cases. The outbreak of the war naturally delayed the publication of the paper. In all he has notes on 13 cases in which the teeth have been grooved by the nerve in question with four others in which a true passage was present. The explanation is probably a purely mechanical one. The immobility of the second molar is primarily responsible when the wisdom tooth is forced upwards and forwards and in extreme cases the oblique direction becomes horizontal and the tooth remains in inclusion. Immediately below the bulb of the wisdom tooth lies the inferior dental nerve and it is not difficult to understand why in the course of development of this tooth and its calcification the nerve might be either completely enclosed in a dental canal or lie in a groove in the substance of the tooth. A collateral phenomenon of importance is the inclusion in the same paths of the proper blood vessels. Of much significance is the fact that the inclusion of these structures is not limited to the vestibular side of the tooth but is also seen on the lingual side. The phenomenon which has been described is not peculiar to wisdom teeth and nerve furrows have been seen in the second and even the first molars. But complete canalization and most of the cases of furrowing have been seen in wisdom teeth. Two teeth may be grooved, as in one of the cases involved.

the first and second molars. Finally the author has seen a central incisor grooved by a blood vessel.

Definition of Dental Caries. Fargin-Fayolle. *Revue de Stomatologie*, 1920, xxii, No. 3.

Dental caries has been termed erroneously a dentinitis, as if limited to the dentine. The term is an unfortunate one, like pyorrhea alveolaris. Quotations from standard textbooks show that caries is termed a softening of the hard tissues of the teeth—dentine and enamel—and that this softening is of inflammatory nature. In reality caries is made up of several distinct conditions such as mechanical injury which may lead to cavity formation, dental erosion which may imitate true caries at times, the so-called dysplasia of Capdepon and other lacunar losses of substance which are distinct from true caries. When we come to the latter in the narrower or inflammatory sense this process is believed to affect essentially the hard tissues. The author would eliminate the necessity of an inflammatory or infectious component despite the practical importance of this feature, for the same kind of lesions may result in the total absence of these factors. Cavities, however formed, begin externally and extend into the substance of the tooth; but the principal distinction between ordinary or conventional caries and the mechanical, developmental and other forms is that in the former the cavities are really atypical both in character and in point of departure when compared with erosions, lacunar formations, mechanical injury and the dysplasia of Capdepon. In these forms both cavity shape and point of departure are typical.

The Maxillofacial Service at the A. R. C. M. H. No. 1, A. E. F., France. W. T. Coughlin, M.D., F.A.C.S. *Medical Record*, 1920, xcvi, No. 18.

The initials A. R. C. M. H. refer to the original American Ambulance No. 1, Paris. This hospital was situated just outside the Maillot gate of the city and was improvised from a high school which at the time—1914—was in course of construction. The responsible head was the University of Pennsylvania and at the very outset a maxillofacial service was begun in charge of two American dentists who were in practice at Paris. Many exhibits of the excellence of the work done may be seen in the future in the Army Medical Museum at Washington. The department was finally closed in February, 1919. Soon after its inception the hospital was taken over by the American Red Cross and became known thenceforth as the American Red Cross Military Hospital No. 1. The author with three others forming the "oral and plastic unit" began to function in April, 1918. The surgeon in charge of the maxillofacial service was Chas. A. Powers of Denver. The rush of work began in the following May. The ward for face and jaw cases contained 55 beds and at times overflow cases were cared for in the general surgical wards. But few patients were in danger of imminent death—about half a dozen died of suffocative phlegmon and sepsis. The first aid consisted in relieving pain and securing rough coaptation. Tracheotomy was never necessary. A ligature served to keep the tongue from dropping back. Swelling was prevented by hooks and elastic traction. In wounds involving the floor of the mouth no steps were taken to prevent fistula formation. Dakin's solu-

tion was found the best for irrigation at the outset and permanganate after the fifth day. Of six deaths exclusive of those mentioned above pneumonia came in four, secondary hemorrhage and meningitis the others. But few cases of fractured jaw required wiring the teeth, ordinary fixation measures proving sufficient as a rule. Drainage was not always instituted at the start but at times only on signs of infection. Fragments of bone and suspicious teeth were given a chance to heal in and even when quite loose were not removed until three weeks. The splint in common use was the "closed bite," the "open bite" apparatus being required only in certain bilateral fractures of the anterior portion of the lower jaw. In the former type a gutter capped the teeth of the entire jaw and patients were made to chew gum when the mouth was first opened. When the upper jaw was fractured the rhinologist was always called in. To this fact was due the absence of empyema of the antrum. Dobell's solution was used in the nose in preference to Dakin's. Plastic work was undertaken just as soon as the wounds had healed. All bone, fat and epithelial transplantation was done under local anesthesia. No case of infection was lighted up by grafting. Between January, 1918, and February, 1919, something over 300 cases passed through the hospital.

Noma. Calvache. *La Odontologia*, 1919, xxvi, Nos. 11-12.

Several cases of noma are reported, as follows: A girl of nineteen suffered from a severe attack of enteritis which was followed by gangrene of the cheek and commissure of the mouth. This case was of the so-called "acute" type, as there was no constitutional disturbance and the process was spontaneously arrested and healed up. The resulting deformity interfered with closing the mouth and was eventually relieved by a plastic operation. The second case occurred in a child of four years and ended fatally. Few details are given. Even less is said of the third case which also ended fatally despite the use of salvarsan. The fourth case is given in detail. The patient was a boy of five years with history of osteomyelitis of the lower jaw, ulcerative stomatitis, inflammation of the mouth and noma. The state of affairs was attributed by the ignorant parents to a dentist who had extracted several teeth, but it was evident that the teeth were badly infected at the time. The first measures used were hydrogen peroxide, iodoform and solution of aluminium acetate. The patient died on the fifteenth day a large bony sequestrum was brought away. The noma appeared as a sequela to the other lesions and was treated vigorously with thermocautery and salvarsan and with ultimate success, although at one time the prognosis was very grave. A fistula was left in the cheek, one centimeter in diameter. A fifth case is given which followed an attack of measles. The cause is unknown but the prognosis was grave at the last visit. The sixth case was much like the fourth, the patient having osteomyelitis of the lower jaw and ulceromembranous stomatitis before the noma appeared. The treatment followed along the same lines and the condition appears to have been aborted. In the discussion which followed the delivery of the paper other cases were mentioned and it is evident that noma is a fairly common condition to the Spanish oral surgeon who identifies it by the peculiar color of the parts before gangrene itself sets in—evidence—a waxy hue.

Relations of Otorhinolaryngology to Stomatology. Gradenigo. La Riforma Stomatologica, 1919, i, No. 1.

The distinguished otologist gives a very brief summary of the points of contact between these special disciplines. These points are numerous. Thus a sepsis in the buccal cavity may begin in carious teeth, in pyorrhea alveolaris, in the palatal tonsil, etc. A frequent association occurs between buccal sepsis on the one hand and recurrent tonsillitis and chronic adenoids on the other. Vincent's angina is a condition which affects alike the mucosa of the cheeks, the gums, throat, tonsil, etc. Another point of contact is seen in the connection between obstructed respiration and the shape of the dental arch. We find associated in a subject nasal obstruction from whatever cause, and a sort of dental ataxia. From one angle the nose in these cases is underdeveloped as a result of disuse. This subdevelopment is quickly manifested in a bad implantation of the teeth. In such cases the nasal obstruction is removed and the dental deformity corrected by wearing orthodontic prosthesis. In cleft and paralysed palate phonation and deglutition are notably interfered with: hence to secure orthophonia there should be coöperation between the rhinologist and stomatologist. Infection of the roots of the upper teeth is at times the cause of maxillary empyema. Dental empyema is the most common etiologic type in practice and is the most readily relieved, for the treatment consists in the extraction of the infected teeth. The relationship between buccal and aural troubles is less obvious. Carious teeth sometimes cause earache and a true otitis is simulated. Such a source of confusion is readily removed in practice.

Treatment of Dental Hemorrhage by Injection of Nolf's Propeptone. Fauconnier. Revue Trimestrielle Belge de Stomatologie, 1919, xvii, No. 1.

The author announces that alveolar hemorrhages which follow dental extraction may be both prevented and cured by subcutaneous or intramuscular injection of Nolf's propeptone. Nolf as is well known is one of the pioneers in the protein therapy of disease and recommended injection of peptone in hemophilia as far back as 1908. Human and horse serum have also long ago been tested in this respect. The solution in use is not a proprietary but may be made up by any one, 5 gm. of Witte's peptone and half a gram of sodium chloride being dissolved in 100 c.c. of water, the whole being sterilized by heat—120° C. for 15 minutes. Persistent and marked hemorrhage after extraction being looked upon as essentially hemophilic, a known bleeder will naturally receive a preventive injection. An injection may be made 24 hours before the proposed extraction or there may be 2 injections, one from 12 to 24 and the other 4 or 5 hours before extraction. If, however, hemophilia is recognized only after extraction, a curative injection of 10 c.c. of the solution is at once practiced, and if necessary repeated. Thus far anaphylaxis has not been seen in this connection. The injection is always made at a distance, and if intramuscular, in the buttocks. The rationale of the remedy is bound up in the property of propeptone to hasten the coagulation of the blood.

Error in X-Ray Diagnosis. Gilmour. *The Dental Record*, 1920, xl, N

The patient was a boy of fourteen years first seen about October, The consultation was hurried but nothing serious was perceived. In Christmas week, 1919, he was seen again with a discharge and fetid odor from between upper right central and right lateral incisors, where a pocket of pus was found. Both teeth contained dead and fetid pulps and were drained, treated, and wired. The trouble was the result apparently of a direct trauma two years before which had required wiring. It was said by the dentist at the time that the teeth could not be saved. By the Easter following the filling, the teeth were still giving trouble and an x-ray was taken. The diagnosis was fracture of the right lateral incisor with some absorption following apicitis. The apex of the lateral incisor was suspicious. By the following August or September the author, being certain that the tooth was fractured and should come out, pulled it. He was much chagrined to learn that the tooth was sound throughout. The proper course was to reimplant it which was done and an x-ray at once taken to determine the success. The plate showed the same deceptive appearance of fracture as before. After the tooth seemed to have healed in, the wire was removed and the implanted tooth was soldered to the other central incisor. It should last at least 3 or 4 years after which a denture can be substituted if necessary. The oblique line across the tooth as seen in the plate which simulated a fracture was probably the thickened margin of the alveolus after partial absorption had occurred.

Late Accidents of Local Anesthesia. Fichot. *Revue de Stomatologie*, No. 3.

The type of case referred to is as follows: Two or three hours after intervention there is felt an indefinable anguish, a sense of shock followed by a chill of violent character. Dyspnea and nausea are added and usually headache and at times vomiting. The syndrome is the same as that sometimes seen at an earlier period and during intervention, but is not so pronounced and is in fact a delayed appearance of an accident of operation. The patient is found to have a moderate degree of fever and this subsides after six or eight hours. The pulse is usually accelerated in proportion, but exceptionally cases of bradycardia have been seen. The blood pressure apparatus of Pachon shows a characteristic lowering of tension. This was seen both in normal and hypertensive subjects. In a subject whose normal oscillation was 170 to 90 the pressure fell down to 115-70. The viscosity of the blood was slightly increased. The vagal reflex persisted and the oculocardiac reflex was either abolished or not diminished. Blood counts were not systematically studied but appear to agree with those seen in the accidents of early anesthesia. All goes to show that this syndrome represents an intoxication without any element of infection. Of the cases studied by the author not one had been exposed to the accidents of an effective technic. The syndrome appears to agree in all respects with the so-called hemoclastic crisis of recent writers which has a basis in a disturbance of equilibrium of the colloids of the blood. This can be brought about by the injection of crystalloid as well as colloid substances, including some of the colloids. Other possible factors have to be kept in mind, as the natural action

the drug and its tropism for certain nerve centers, the effect of possible capillary embolism, psychic components, etc., and of the personal equation of these anesthetic cases, which is marked.

Pyorrhea Alveolaris. Puterbaugh. *Journal of the National Dental Association*, 1920, vii, No. 4.

Irrespective of the specific cause the author attributes to serumal calculus deposited just under the free gingival fold the determining influence in the genesis of the affection. Without this factor the disease does not develop. The deposit is due to a perversion of the gingival secretion which in turn may be due to numerous factors. Considerable stress is laid on constitutional factors of which many may be accused. The belief of former days that chronic dyspeptics are very prone to pyorrhea still obtains but a vicious circle is doubtless present for pyorrhea seems able to set up a form in indigestion. In order to visualize the ability of constitutional factors to produce pyorrhea, it is necessary that the subject have a clean mouth free from caries or fillings. The supervention of pyorrhea in a clean young subject following a constitutional affection like tuberculosis brings out this relationship. Local factors which provoke the deposit of serumal calculus are also numerous. Salivary calculus produces recession of the gums without pocket formation. The principal local factors are the accumulation of food between the teeth and the presence of irritating crowns and bridges, while faulty contacts naturally play a role. Of early symptoms bleeding of the gums on pressure over the margin indicates that ulceration has begun. Subjective symptoms are discomforts such as the sensation of a foreign body wedged between the teeth. Marginal gingivitis is not necessarily pyorrhea, the latter not being in evidence until the pockets of pus have formed. The pyorrhea subject may be remarkably free from caries because of his alkaline salivary reaction which is associated with putrefaction, the latter causing the characteristic odor of pyorrhea. The latter should be differentiated from salivary calculus, ordinary swollen and bleeding gums, senile retraction of the gums, simple marginal gingivitis, etc.

Impacted Lower Third Molars. Nodine, A.M. *New York Medical Journal*, 1919, cx, 762.

The predisposing causes of impaction of lower third molars are: (1) defective embryonic development; (2) perverted development; (3) malnutrition; (4) syphilis; (5) rachitis; (6) neurotic tendency; (7) eruptive fevers; (8) anæmia; (9) artificial feeding; (10) scurvy; (11) cretinism; and (12) idiocy. The exciting causes are: (1) arrested maxillary development; (2) undue thickening and resistance of the overlying tissue; (3) undue stimulation of the inferior dental nerve by pathologic conditions producing nutritional changes that intensify the bone in the region of the impacted tooth; (4) malposition due to contracted dental arches; (5) severe traumatism to the jaws causing deposition of lime salts in the cancellous tissue; (6) too early loss or extraction of deciduous teeth producing abnormal density of the cancellous tissue of the mandible; (7) improper orthodontic treatment; (8) improper or excessive pressure in orthodontic cases; (9) inflammations of the jaw bones caused by decayed teeth; and (10) a

local increase in the density of the bone brought about by inflammation of the periodontal membrane extending into the alveolar process.

The general effects of impacted teeth are functional, nervous, and mental disorders, paralysis of the arm, tonic spasm of the upper extremities, nervousness, insomnia, epilepsy, etc.

The Height of the Palate in Relation to Adenoids and Chronic Otitis
Editorial, *Medical Herald*, xxxix, No. 4, p. 94.

The large majority of medical men believe the adenoids cause the high V-shaped palate and its dire consequences.

Many discussions on this subject have taken place, and at an early date it was noticed that an abnormally high and narrow palate was accompanied by adenoid growths in the nasopharyngeal sac. Prof. Halmagren of Stockholm carried on investigations with the aim of discovering whether any connection could be discovered between the occurrence of chronic otitis and the existence of a high and narrow form of face.

Leptoprosopia is an expression of a general contour of the facial structure of certain individuals, being a relative extension in height, but more especially a narrower form of face. The general contour that in certain more extreme forms is very noticeable at first sight, is found in 43.5 per cent in the proportions of the face, nasal apertures, and the palate, and in 39.5 per cent either in the facial conditions as regards shape or that of the nasal apertures together with a high narrow palate. The high and narrow palate, hypsistaphylia, is the thoroughly characteristic indication of the leptoprosopic type. To an extremely high degree adenoid growths occur in company with a high and narrow palate while the palatal index of height and breadth in persons not suffering from any disease of the nose or ear, nor any glandular hyperplasias, on an average is 42.56; the index in cases with adenoid growths is 51.08. About 72 per cent of those having glandular hyperplasias in the nasopharynx showed one or other symptom of or predisposition to diseases of the ear.

Wright and Smith, in their work on "Diseases of the Nose and Throat," have the following: "Unquestionably the narrow high palatal arch and consequent narrow jaw and compressed nasal alae are associated more frequently with tonsils and adenoids than the primitive type of jaw. It is true one phenomenon is occasionally seen without the other, but the frequency of their association is so striking that coincidence without any relation of cause and effect is not a tenable argument. We are driven to conclude that in a general way the one is the sequence of the other. No mechanism has ever been demonstrated which has satisfied the reason or escaped the experimental demonstration of its inaccuracy in defending the thesis that the adenoids are the antecedent and the narrow alveolar arch is the consequence in the chain of causation. We believe that all the evidence points the other way. Children have adenoids because their parents transmit to them the inheritance of narrow jaws. The parents do not have the narrow jaws as an acquired trait, but as an evolutionary one. This we believe to be the chief hereditary factor in the etiology of the occurrence of adenoids and tonsils. We do not assert that it is the chief cause in the

etiology, but we confidently believe it accounts for the hereditary factor which can not be ignored."

It is, however, rather to environment than to heredity we must look for the most important factor in the etiology. It is to the frequent repetition of congestions of the mucosa of the pharynx that we trace both clinically and pathologically the genesis of lymphoid hypertrophy. Aside from repeated inflammations the lymphoid tissue receives the stimulus to proliferation from the direct impact of imperfectly filtered and moistened air and of secretions of the nasal chambers and their annexed cavities. The latter are as plainly a sequence of a narrow and distorted nasal passage as are the attacks of inflammation of the nasal and pharyngeal mucosa.

The Causative Relation Between Febrile States and Eruption of the Teeth.

H. Abels. *Deutsche Medizinische Wochenschrift*, 1919, No. 14, p. 392.

The view to the effect that the eruption of the teeth is the cause of numerous diseased conditions is designated by the authors as misleading and dangerous, although it is supported by the contention of numerous physicians and by popular opinion. A connection between febrile affections and dentition does exist, but in the opposite sense, many febrile diseases lead to an increased eruption of teeth, in the same way as the increased growth of children during and after febrile disease, through the stimulating action of the toxins upon the epiphyses. It is also a well-known fact that mechanical or chemical stimulation of an epiphysis exerts a favoring influence upon the growth of the corresponding bone.

Gangrenous Inflammation of the Tooth Germ. H. Kassowitz. *Deutsche Medizinische Wochenschrift*, 1919, No. 14, p. 392.

An infant with gangrenous inflammation of the tooth germs was presented by the authors before a recent meeting of the Vienna Medical Society. The molar milk tooth, which had become visible, was removed with forceps, and a large amount of pus was evacuated. This disease was first described by Swoboda, and nine cases have so far been placed on record, all of which died except one. In the present instance, a cure was expected to result.

Etiology of Ulcerous Stomatitis. Bercher. *Revue de Stomatologie*, April, 1920, xxii, No. 4.

Many years ago Bergeron isolated this affection as a "specific, contagious and inoculable malady." This view was not universally accepted, however, until Vincent had demonstrated the constant presence of the fuso-spirillary symbiosis. But during the war it has been claimed of this affection that it is not contagious and not epidemic. From evidence accumulated in Roumania it is a general condition of alimentary origin. The epidemic sore mouths and sore throats seen on ship board are only pseudoepidemics. This is the view of the hygienists, but not of the stomatologists. The two views are not absolutely antagonistic, for the dietetic factor may simply serve as a predisposition to the operation of local and bacterial causes. Another factor long ago urged has been revived in the eruption of a tooth, whether a deciduous tooth in a child, or a permanent tooth

in later years, especially the wisdom tooth. From this angle ulcerative stomatitis begins with infection about the erupting tooth and involves the mouth from the single focus. The author having access to abundant material in the Val-de-Grâce Hospital, has sought to bring about harmony among these somewhat conflicting views. It is easy to isolate a wisdom-tooth group which is classical. Cases do occur, however, in which the evolution of the wisdom tooth is normal and here we may see a Vincent pharyngitis, the buccal cavity remaining intact. The connection here is obscure. Between these extremes there are transitions. There are cases given of Vincent's angina with normal eruption of the wisdom tooth or rather with elimination of the wisdom tooth factor—for an x-ray showed that no wisdom tooth was undergoing eruption at the time. We can only conclude that the fusio-spirillary symbiosis can attack the mouth under a variety of conditions due to widely different predisposing factors, of which eruption of the teeth is an important one.

Dental Forensic Cases. Hentze. *Zahnärztliche Rundschau*, May 11, 1929, xxix, No. 19.

The author who practices as a forensic physician states that it is not uncommon for the patient of a dentist to ask whether there are grounds for damages suits. He gives several cases in point one of which is as follows. The patient, a woman, was referred to him by a dentist to decide the question of possible malpractice by another dentist. The record of the case which was treated at a dental polyclinic appeared to incriminate the operator. The latter having diagnosed a necrotic ulcerated tooth which demanded extraction made an injection of an obtunding solution which caused violent pain while the extraction itself was very painful. The pains had not subsided and had in fact increased with swelling of the cheek. The operator ordered chamomile poultices but the painful condition persisted for three weeks, at which period dead bone separated, leaving loosened teeth. The author was about to certify to the fact of malpractice when it was learned that before the present experience the patient had suffered in a similar manner at the hands of another dentist. Two months before visiting the author she had had two teeth pulled under local anesthesia. The entire experience was similar, the injection having been painful and bone having finally come away. It was further learned that the woman had recently gone through an inunction cure for syphilis which had presumably caused mercurialism of the mouth with loosening of the teeth. The patient was now thoroughly examined. There was a fistulous opening in the lower jaw from which pus exuded, the probe showing dead bone. A strong oral fetor was present. After an x-ray had been taken the sequester was removed. The Wassermann was negative and there was no evidence that the patient had ever contracted syphilis nor was there evidence of past mercurialism. The condition was plainly an osteomyelitis of the lower jaw and while the dental manipulations had undoubtedly aggravated the condition and precipitated it, it became doubtful whether the dentist accused was accountable for failing to detect the presence of osteomyelitis.

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EDITORIALS

Radical Propaganda for the Extraction of Pulpless Teeth

A FEW years ago, certain members of the Research Commission of the National Dental Association, produced evidence which seemed to prove that infections at the roots of pulpless teeth might be carried through the blood stream and cause systemic disturbances, and a number of the medical and dental profession became more or less alarmed as to the future of such teeth. There seems to be very little doubt, as the result of experiment which has been carried on by Price, Hartzell and others, that systemic infection can be associated with pulpless teeth, and therefore some men reason that such teeth are a source of trouble, and consequently to avoid this trouble all pulpless teeth should be extracted. The evidence presented against the advisability of retaining pulpless teeth in the oral cavity seemed to be so overwhelming in the minds of some dentists that they at once began advocating the extraction of all teeth from which pulps had been removed. Some of them even went so far as to say that if it was

necessary to remove the pulp from a tooth; because of disease of that pulp it would be better to extract the tooth in the beginning and not make any attempt to save it. Others contended that even if a tooth was saved by the filling of the roots according to standard methods of treatment, it would only be a short time until the tooth would give trouble and it would necessarily have to be extracted at a later age. All of the evidence that could be produced in favor of retaining pulpless teeth was immediately set aside, and the only evidence that was considered, was the "case reports" of a certain number of patients in whom it was supposed that systemic infection could be traced to pulpless teeth and infection at the ends of the roots.

While it is true that some patients with systemic infection have improved upon the removal of the pulpless teeth, it is also equally true that a large percentage of systemic infections do not improve when such teeth are removed. Cases have been reported where patients who have been suffering from a rheumatic tendency, arthritis, arteritis, endarteritis and endocarditis have improved upon the removal of pulpless teeth. Even when such an improvement occurs it does not necessarily prove that the systemic infection has been caused by infection at the ends of the pulpless teeth, for the fact is not proved that the infection of the teeth was the only infection present in the body. Very often when this improvement occurs, it is the result of the "change of balance" between the number of microorganisms in the system of the individual and the number of microorganisms which the leucocytes and the system can take care of.

Our friends, the "radical extractors of pulpless teeth," seem to forget that the individual possesses a great many other sources of infection besides the teeth. They also seem to forget that even though they have proved that germs are present at the end of the tooth root, they must also prove that germs are not present elsewhere. Improvement at the time of extraction or shortly after does not prove that the pulpless tooth was the source of the trouble, but only proves one of two other things. First, by the removal of the teeth some of the sources of infection in the body have been eliminated which changes the "balance" for a certain period of time. Second, by the removal of the teeth some of the blood vessels in the immediate area of infection have been opened and some of the germs which were present around the tooth have gained entrance into the blood stream and have produced a change therein similar to bacterial vaccine, and consequently have greatly increased the action of the leucocytes for a period of time. After the removal of a pulpless tooth it is very often observed that the individual has a rise of temperature, increased pulse which is generally caused by germs entering the blood stream and which acts upon the blood contents in a beneficial manner, and after the recovery of the first shock from the extraction of the tooth and the rise in temperature, the individual immediately improves.

This condition only proves the pulpless tooth has been one of probably many sources of infection in the body, and the removal of this tooth may be sufficient to produce a change in the systemic condition. However, in a large percentage of cases we find the ultimate result after the extraction of the pulpless tooth is not the permanent cure and does not produce the result which a great many of these "radical operators," unfortunately, have told their patients would occur.

It must be remembered that there may be an infection anywhere in the

mentary tract, in the liver, the gall bladder, kidneys, fallopian tubes, prostate glands, or any other part of the anatomy. It must also be remembered that a great many more rheumatic conditions associated with systemic disturbances are the result of gonorrhea than are caused by pulpless teeth. The teeth are only one part of the anatomy of the individual, and they play a relative ratio to systemic infections that they play to the relative anatomical construction of the individual. For instance, we have about 30 feet of alimentary canal of which the oral cavity is only about one-sixtieth of that length, and therefore we might safely say that one-sixtieth of the systemic infection occurring in the individual, results from disturbances in the oral cavity. This does not even take into account other anatomic structures which also must be considered.

We must remember that we have the tonsils located in the pharynx which contain a large number of open crypts, and which in the majority of individuals become infected some time in life. It is our belief that in a great many instances where we find germs at the ends of pulpless teeth, the tonsils have been the primary source of infection and the teeth have been secondary. While we may succeed in locating the secondary infection from the tonsil crypts to the tooth, we must also remember that there probably are other sources of secondary infection besides the teeth, that are just as detrimental, probably more so, to the health of the individual than is the tooth.

Another thing which must be remembered is that when the so-called granuloma is found at the end of the tooth, even though germs are found in that granuloma, there is no positive evidence that the granuloma is the cause of the systemic infection in the individual. Postmortems of practically every adult show tuberculous infection in the lungs and from some of those tuberculous infections you can get tubercle bacilli, but it is an established fact that the individual did not die from tuberculosis, and ninety chances out of a hundred would not have succumbed to the disease because of the fact the germ was sealed in by a protective limiting member which confined the infection. The granuloma which developed on the ends of teeth in the majority of cases is of such development and even though after the extraction of the tooth you open the granuloma and find a virulent germ which will produce all sorts of things when injected into an abdominal cavity of a rabbit, does not necessarily prove that this germ was detrimental to the individual, because Nature had built a fibrous membrane around it and would have eventually destroyed it.

Our radical friends will say that even if the germ is found in the granuloma the tooth should be extracted as a prophylactic measure, because the germ might become detrimental to the individual at a later period in life. According to this argument we might as well cut out every portion of the alimentary canal, in fact, we might advise a surgical removal of every organ of the body, because there are times in the life of every individual when it will be possible to grow germs from some part of practically every organ in the system. Anyone who has studied pathology and bacteriology and the process of infection knows that the system of the individual is subject to infection at all times in life, subject to the invasion of all kinds of microorganisms, but as a rule, these germs are eliminated and the individual lives a long and useful life after the invasion. However, if we would follow the teaching of the "radical extractors

of pulpless teeth" and apply the same treatment to all parts of the body where they insist on giving the teeth, in a very short time our organs would be so perished with, suffer such radical surgical treatment, that there would be nothing left for the radical operators to work on, because we would all be dead.

Until such times as the science of bacteriology has advanced to such a point that we can eliminate microorganisms from all parts of the body, I do not believe pulpless teeth are the great source of systemic infection, that has been claimed by radical operators whose principal and only means of livelihood is in the removal and extraction of teeth.

It has often been said that a little knowledge is a dangerous thing, and this is certainly true in regard to pulpless teeth. For instance, probably the one who knows as much as anyone in regard to systemic infections from the teeth has been more often misquoted than any one. We refer to Dr. Thomas Hartzell, of Minneapolis. It is true Dr. Hartzell called the attention of the dental profession to systemic infections from pulpless teeth, but we have no knowledge of his ever having made the statement that all such teeth should be extracted and that all pulpless teeth were sources of systemic infection. The radical operators and extractors have taken a small portion of Hartzell's investigation and have built a false hypothesis around it, and are using a scientific investigation as a means of furthering their own interests. We mean the financial interest they receive from the extraction of teeth.

If these radical extractors were content simply to remove the tooth, it would not be so bad, but they have even gone further than that, and some are advocating the removal of the tooth and a large amount of the alveolar process which surrounds the tooth, with the idea of getting all the infection which has invaded the cancellous portion of the alveolar process. The so-called "surgical removal of the tooth" whereby a large portion of the alveolar process is removed has never been indicated from a surgical standpoint, and is not recommended by men who have a knowledge of the histology and pathology of the process of infection and repair. It seems to us that those who advocate the surgical removal of a tooth are doing so in the majority of cases to greatly impress the patient, thereby make the operation look more serious and enable them to collect a fee proportional to the amount of "scare" they can "throw" into their patients. Probably from the financial standpoint, and working upon the basis that every individual is trying to get as much out of his patient as he can, the operator might be justified from a selfish standpoint. However, not only do they succeed in "scaring" the patient and extracting a fee much greater in proportion to the service which they render, but they leave the patient in such a condition as to make it practically impossible for the dental profession to provide the patient with artificial substitutes which will render a serviceable function in the mastication of food. Taking the dental profession as a scientific organization, we believe that when they remove a natural tooth, they should leave the supporting and remaining tissue in such a shape that an artificial substitute can be placed, which will be of service and comfort to the patient. With the radical removal of the teeth and the alveolar process the remaining tissue in the mouth is left in such a condition that it is impossible to make a proper and anatomic denture—one that will be serviceable—because so much structure has been removed that there is nothing to work

In viewing the radical propaganda for the extraction of pulpless teeth, we believe it is wrong. First, because only a small percentage of such teeth ever produced systemic infection. Second, because the radiograms show an area at the end of the roots does not prove that the tooth is the source of systemic disturbance to the individual. Third, because the systemic infection is present in the individual, and pulpless teeth are present in the mouth, which show that rarefied area does not prove that the pulpless tooth is the cause of the systemic infection, for, first, it may have nothing to do with it, and second, it may be developed as result of infection in some other part of the body. Fourth, because the extraction of the tooth seems to improve the systemic condition does not prove the pulpless tooth was the original cause, but may be only one of many focal infections which is contributing to the rheumatic condition, also that the removal of the tooth acted as a vaccine and produced an improvement in the systemic condition for a period of time, because a certain number of germs entered the blood stream upon the extraction of the tooth. Fifth, until such a time as all bacterial infection and invasion of the human system can be eliminated, we are opposed to contributing so much importance to the oral cavity as a source of infection, and eliminating all other sources of infection along the alimentary canal and other organs such as the gall bladder, liver, kidneys, fallopian tubes, prostate glands, etc. Sixth, the surgical removal of teeth by a cutting away of the alveolar process is the worst thing yet recommended, because the after results are such as can not be satisfactorily handled and the individual is no better from a surgical and pathologic standpoint, than he would have been with a more conservative removal of the tooth and proper treatment of the source of infection, provided there was any infection in the tooth. Seventh, because upon the removal of the tooth and granuloma, microorganisms are found within the connective tissue sac at the root of the tooth does not prove that that germ is the source of infection, because we have not established the fact that the germ was able to penetrate the limiting membrane. Eighth, those in favor of radical removal of pulpless teeth should make a greater study of histology and pathology, understand the conditions of repair and infection and remember that pulpless teeth are subject to the same rules of repair as are found in other parts of the body.

We do not claim that pulpless teeth are never a source of trouble, but we do believe many troubles are attributed to them which are caused by something else.

ORTHODONTIC NEWS AND NOTES

The editors desire to make this department a permanent feature of the journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

American Dental Library and Museum Association

The next annual meeting of the American Dental Library and Museum Association will be held, August 23, 1920, 3:30 P.M., at the Forsyth Dental Infirmary, Boston, Mass.

At that session the official business will be taken up and a permanent constitution adopted.

All societies, colleges, etc., applying before that time will be included as charter members.

Another session will be held later in the week to suit the convenience of the majority of members, when an interesting program pertaining to library and museum matters will be given.

Dr. Wm. Bebb will present a short paper dealing with methods of building libraries and museums and of conducting same.

Dr. L. Pierce Anthony, *Dental Cosmos*: Advisability of Compiling a Dental Bibliography, a Standard Reference List of Books on Dentistry Published Throughout the World. The last one compiled in this country was by C. G. Crowley in 1885.

Dr. B. W. Weinberger: Bibliography of Dental Periodicals Published in the United States and Great Britain.

All those interested are requested to be present.

A. F. Isham, Pres.

B. W. Weinberger, Sec'y, Treas.

40 East 41st Street, New York

European Orthodontia Society

Owing to untoward circumstances, and on account of the present difficulties of travel, the next meeting of the European Orthodontia Society, which was to take place in Amsterdam in July next, has been postponed to a more suitable time and place. Due notice will be given to all interested. For all information address Dr. James T. Quintero, Sec'y, 1, Quai Jules Courmont, Lyon, France.

Announcement

Doctor James T. Quintero announces that he has resumed the practice of Orthodontia at No. 1, Quai J. Courmont, in Lyon, France.

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ORIGINAL ARTICLES

WHY WE INSIST ON EARLY ORTHODONTIA TREATMENT*

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THE question of early treatment has been so well impressed upon my mind in an effort to secure and maintain the best possible results for the patient that I unhesitatingly confess that we are not making an endeavor, as probably we should, to educate the public to the urgent necessity of attending to irregular teeth and malformed arches early enough in a child's life.

The great majority of children that undergo orthodontic treatment, I believe you will agree, have erupted the majority of the permanent teeth. This being the case, the necessity of retention must be longer and more uncertain than if these children were treated when they retained the temporary teeth. Cases that do not show a tendency toward malformation until after the eruption of the permanent teeth can not be considered before, but most all cases show some evidence of abnormal development long before it is generally deemed advisable to subject the child to orthodontic treatment.

In going over the literature published on this subject a great deal is said in reference to Dento-Facial deformities, how to correct them, and the appliances employed to accomplish the end result.

This is essential as we can not select the patients and they must be treated regardless of the age, provided the work is beneficial to them.

However, it is quite noticeable how few cases are treated, at least illustrated in articles which are published showing any evidence of prevention. The young child less than seven or even five or six years of age can be handled with more ease, and decidedly better results can be gained with fewer appointments, and with less inconvenience due to a long and tedious retention.

*Read before the Alumni Society of the Dewey School of Orthodontia, April, 1920.

Every mother should be impressed with the necessity of reporting to the orthodontist at intervals, beginning with the eruption of the first temporary tooth until such time as the child is assured of a perfectly formed arch with the teeth in correct position.

In my practice it is a pleasure to work for a number of children three, four, and five years of age. The cooperation in these cases is the best and the retention is permanent.

Even though something prevents the proper eruption of the succeeding teeth, time has been saved and in the end the result is more satisfactory. I believe it is possible to fulfill the demand of science in orthodontic procedure. This necessitates a close study and a more intimate knowledge of the habits of bone growth and of the tissues we are to operate upon, for let us remember that we can do nothing of permanent value by ourselves in our efforts at treatment, but only as we work in conjunction with Nature, studying her carefully, interpreting her wishes and intelligently assisting in her efforts of growth and development. Fortunately we have some wonderful chapters on histology, embryology, and a study of these must convince us of the most active period of development. The beginning and ending of calcification of the osseous tissue should be a guide in assisting Nature to build the parts in harmony according to normal influences. If we are going to allow abnormal influences to intervene at three years of age and then correct them at twelve, our method must be other than the importance of a full complement of teeth well arranged and the very important part that each tooth plays in its relation to all the teeth of the denture, that the denture may not only be in function most efficiently but that it may contribute its full part to the normal beauty and balance of the face according to the individual type, and also its normal part in the possibility of normal growth and development of the throat and nose, all of which are essential to the health and growth of the individual. To recognize and correct abnormal influences in their early stages, means a great deal toward prevention, and while in itself not complete, will aid materially in treatments and shorten the period of retention.

We have many types of children to deal with and in varying stages of development, and our chances are great in studying the details which lead to about the most satisfactory results. It also enables us to see the advantages and disadvantages of certain forms of appliances used when treating young children and the ones employed in older children, as, I believe you all agree that very delicate appliances in the form of a lingual bar are sufficient in these young cases and in many instances adjusted only to the lower teeth. There are exceptional cases, however, which demand considerable root movement, even though in children quite young, and our appliances should be such as will best fulfill these demands. Anxious parents are extremely grateful for any assurance of a successful and permanent result, and it is only in the case of young children that we can rely upon the result as being permanent without a great deal of discomfort to the patient in wearing retaining appliances for an indefinite period.

Cleanliness of the mouth must be observed during the treatment, and if the appliances are adjusted to temporary teeth as much as possible, we can avoid injury to the permanent teeth which will occur at least to a limited, if not to a very great, extent. The actual movement of teeth apparently seems to be accomplished in the older patients almost as readily as in younger children, but the retention in the older children of twelve to fourteen are never positive in my experience. I do not mean that the arches collapse entirely or that the teeth go back to their original position, but there is invariably some crowding of the anterior portion of the arch with one or two teeth slightly overlapping on the lingual or buccal inclination of some tooth. This condition of affairs spoils the effect of one's efforts toward an ideal result and lessens our hope of ever obtaining what is ultimately desired in these cases.

I was very much interested in an article read before the American Society of Orthodontists last year by Dr. Rogers on "Muscle Training and Its Relation to Orthodontia." In this paper he has to say, "It avails us little if we diligently seek to place one part of the human machine in harmonious relation and neglect the other part upon which permanent success depends."

A number of cases, no doubt, have failed in our hands even after prolonged attention, due to some inability on our part to recognize and correct abnormal influences which continue to act after the retainers are removed. It is often surprising, the cooperation received with these very young children and the instructions to these patients are more religiously carried out. The mothers assume the responsibility for seeing that the child keeps all the appointments and at this early age other allurements have not the attraction to keep the patient from the office, that they have at a later period in life. If the child is supplied with new and correct guiding impulses he is more apt to acquire an ability to combat abnormal influences, bringing about coordination of muscle groups and complete control of their muscular mechanism. This must in time have a beneficial effect upon the parts we are directly concerned in and our teaching has accomplished what later would have been done by mechanical interference, with a useless waste of time and treasure. From the beginning, an individual is constantly surrounded by influences and environmental conditions that ultimately establish the character and development of the parts, and unless every precaution is observed against interference to health and harmony of functional adjustments, disease and disharmony will reign.

Every evidence of interference should be discouraged at its incipency so as not to allow the parts to lose their normal activity in the slightest degree. The solution of our difficulties should, and I believe, will, soon be largely one of prevention; at least, we will be able to so govern the patients that they can be brought to realize the responsibility of their own destinies, to the extent of reporting to the orthodontist early enough, so that preventive measures may be adapted and the slight maldevelopment corrected. This would insure the parents of the necessity of looking after and caring for the temporary teeth, and the importance of their proper retention and loss, and the influence they bear in reference to the permanent set.

The tonsils and respiratory passages should be thoroughly examined for detection of any probable interference from these sources, in fact, each of the forces which tend to produce inharmony of the parts should be eliminated, the attention of the parents called to their probable correction. We should give to Nature a little assistance during her early developing period, at a time when the balance between normal and abnormal is nearly equal and the influences of an abnormal nature are fast making themselves apparent. The natural influences such as cell metabolism, forces of the inclined planes, normal approximation of contacts, harmony of shape, and sizes of the dental arches, atmospheric pressure, muscular pressure and such interferences as may be grouped under the heading of mental, respiratory, and postural may be encouraged to assume their natural attitude toward building the dental apparatus along natural lines in keeping with the individual type. Greater efficiency in development and greater rewards from the standpoint of health must be the result of this attention. The chances are just as great and as necessary or even more necessary in teaching children how to prevent abnormal influences as it is to teach them to overcome certain influences and even though the opportunity has not presented itself for such instructions until after some mechanical correction is found necessary, it will at least prevent further deflections in proportion to the degree of thoroughness in which the instructions have been given, and the sincerity with which they are received and carried out.

Experimenting with appliances for accomplishing the necessary tooth movement in these early cases is much more simplified and the gentle pressure necessary in assisting Nature by stimulating cellular activity can be neatly and physiologically applied in such a way as not to interfere with normal muscular activity, which must be recognized as a great factor in maintaining permanent results.

The displacement of the soft tissues during prolonged treatments has invariably resulted from the appliances that were used and they have exaggerated if not actually produced influences, which did not exist at the beginning of treatment and it is only through well directed efforts that these influences can ever overcome. Dr. E. A. Bogue has written and experimented a great deal on the line of early treatments and sets forth his conclusions in a paper which was published in the *Journal of the American Medical Association*, August 9, 1919, explaining that, "These operations would be almost or quite painless, that they may be accomplished with great rapidity if necessary, and with such certainty that absence through unexpected sickness or protracted journeyings need not interrupt the orderly progress of the work, provided sufficient notice be given to the operator, that the work may be accomplished with no perceptible detriment to the teeth." He reviews a number of very interesting experiments in an article, "Orthodontia of Deciduous Teeth," published in the *Dental Digest*, March, 1919, and says in part, "Another reason why orthodontia of the deciduous teeth should be practiced in civilized communities was brought very forcibly to attention at the Hygienic Exposition in Dresden a few years ago, when I found that the average weight of the brain of the child at birth is 371 grams, at five years of age its average weight being 1,360 grams, and at nineteen years of age 1,400. A gain of 989 grams in the first six years, only 40 grams in the

elve." The masticatory apparatus is a living part of a living thing and is subject to the same general laws as are other parts of the organism and from these weights and other evidence at hand the most active period of development during the first six years of a child's life. "The causes of malocclusion, to be intelligently comprehended, must be studied from the basis of the normal growth of the denture and its correlated parts. Most of the immediate causes are mechanical, yet whatever acts as a hindrance to nature in performing her delicate offices in the unfolding of the various tissues composing the dental apparatus hindering its growth will be operative as a cause in producing malocclusion."—*Angle*, 4th ed. 1907, p. 89.

Dr. Milo Hellman has written some splendid articles in reference to early treatments, one in particular which is beautifully illustrated showing at what an early age the tendency toward malformation can be detected and how readily influences of an abnormal nature make themselves evident and also the pernicious effects of these influences upon the developing masticatory apparatus.

**PRESIDENTIAL ADDRESS BEFORE THE ALUMNI SOCIETY
OF THE DEWEY SCHOOL OF ORTHODONTIA,
APRIL 1, 1920**

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I LIKE to feel that those of us who are gathered here are in true spirit. Many of us, perhaps, sacrifice a much needed vacation to be here. Others, yes, most of us, come at a definite sacrifice in terms of patients that must be turned away. But each year, we look forward with deep anticipation to these few days when, we may by intensive study and a closer companionship with others, constantly improve ourselves and through our individual improvement still more advance our great specialty to the high place it should and must occupy before the people.

Eight years ago I attended a banquet at the Baltimore Hotel in Baltimore City, where a small band of men met together in the first session of the Alumni Society of the Dewey School of Orthodontia. Each year has witnessed a steady and healthy growth; growth in every case of members, who, in their capacities are giving definite contributions to the cause of health and humanity. We who sat around the table at that banquet are proud that we have been the smaller links of our big progressive body of today. And so we grow not alone from study and practice, but from mutual association with men, and the active service in the field have been meeting and solving problems with this annual forum may become the common knowledge of all. And so we learn to teach and be taught, to lead and be led, that through this fine spirit of fellowship we bring to this society, not only our problems, but the sum total of our professional growth, our constructive thinking, which may serve to make our ideal for orthodontia the reality of tomorrow.

I shall in the course of my paper strive to make clear my viewpoint of the fundamental needs of the year.

1. Support of orthodontia through enthusiastic and broad-minded cooperation of our society.
2. Proper relationship between dental science and orthodontia.
3. Provision for proper increase in our numbers, and
4. The development of a definite code of ethics for our profession.

I believe that the first need of every man here is that he recognize his personal responsibility to his specialty and that he must acquire through a synthetic understanding the spirit of sacrifice and hard work, contributed by the founders of orthodontia if he is to be at his best. No one of us can make the profession; no one can ruin it, but each one can advance its progress and in like degree each one can retard. There is in this sense a serious personal obligation which each must face. How many meetings, devoted to personal improvement

Have I attended since I took my course? How many times have I thought to myself while working on a little patient, "Am I giving this child the newest and best care? Have I paid each year the dues I agreed to pay—dues which must be paid unless I wish to restrict the agencies maintained for our individual improvement? Have I contributed any new ideas to orthodontia? Am I a credit to my specialty?" We must face every one of these questions if we are to be a credit to our profession, if we are to be a credit to the men who have devoted their thoughts and energy, so that we might succeed. Many of us feel that because we have completed our course in school that we are perfect. This in itself speaks volumes in praise of the men who have created this confidence, but it is not true. Dr. Dewey has never told a man he was an orthodontist on completing his course; he has merely put down some large strong blocks for the foundation to each man as a beginning, and if it isn't in that man to go on and build squarely on those blocks, gaining his own strength each year, his castle in the air is going to tumble as surely as a balloon will fall without gas.

To be at our best we must know and appreciate a few of the struggles of the men who established our profession. A broad-minded understanding of their handicaps can not but give us added strength to fight our own battles. Two names stand out as living electric signs in our specialty—two men whom every one in dentistry and orthodontia can talk of with a degree of "I know them" in spirit—they are Drs. Angle and Dewey.

When I knew that this address was to be written it did not occur to me to write an eulogy of these two men, but I have listened to many addresses before our societies and feel just as each man before me has felt, we simply can not pass by without saying just a little of what both heart and mind prompt us to say. True, there have been differences and each has his warm followers. The difference is not in spirit or enthusiasm or in loyalty to the cause—it is largely a matter of method and does not in one degree detract from the splendid service which each has rendered.

One of the most valued friendships I have ever possessed is the one I enjoy with Dr. Dewey. And differ as I assuredly would with Dr. Angle on many grounds and points, I can not but feel it a loss that I have not enjoyed his acquaintance also. The question often arises in my mind, "Where would orthodontia be today if it had not been for Dr. Angle?" It is to this man that we owe our beginning, just as we owe to George Washington the beginning of these United States. Washington, with the strength of mind and purpose, fought the opposition of the English and established what is today the strongest and most progressive nation of the world. So with Angle, who fought our early battles for us. He overcame the opposition of the medical men; he proved the practicing dentist without a special training incapable of the practice of orthodontia. He has proved that the foundation of our work could be laid out in eight weeks with a few students in each class to insure thorough work, and these graduates, students still, brought together each year for further study.

A second need which I believe we should face is a clear establishment of the relationship between orthodontia and general dentistry. I have, at different times been in correspondence with Dr. Angle and in a recent letter he makes this

statement: "Orthodontia and Dentistry are as oil and water, they can not be mixed." In a sense this is true, for the best results can not be obtained if one is to mix his practice of orthodontia with a general practice of dentistry. Perhaps this is what the doctor meant. But others have made the same statement with an entirely different meaning, and with this I disagree. My degree reads, "Doctor of Dental Surgery." I am a dentist. If I had received the same teaching at the different dental colleges that I attended as thoroughly as I was drilled in the different branches of orthodontia under Dr. Dewey, I would know a lot more about the oral cavity than I do today. I believe that this situation exists with all of us who are not in the general practice of dentistry, and it is our duty to attend all dental meetings we can. I believe that we should take all the courses in microscopic work, in bacteriology, histology of the tooth, periodontal membrane, and of all surrounding tissues. We are as a whole very much ignorant as to these structures, and of what takes place about them under different conditions such as trauma, devitalization of the pulp, overhanging fillings, crowns, etc., I know I am in many cases, although I have attempted to gain knowledge wherever possible, and especially by personal experience.

How often do we meet the little patient, with the six year molar devitalized or with poorly placed fillings with overhanging edges, maybe a gold crown called a crown, that hasn't even the semblance of a tooth crown, nor does it touch the gingival walls of the tooth closer than an umbrella touches the ground of the person under it when open. Are we as orthodontists to sit back and do nothing under these conditions to continue to exist in the patient's mouth, even though the patient is referred to us by a dentist, because we are afraid we will offend him or are afraid we may lose a patient from him? We must consider this very much differently than we have in the past.

The crux of the matter is this: we do not as a class permit these conditions to exist through willingness, but because we do not have the confidence, the knowledge we should have of the other fields of dentistry and by this ignorance, we are in every such case every prospect of success of our own work on that point. If we understood more the results of these conditions, cases which in the medical profession would be held by the law as pure malpractice, we would not hesitate at one moment to make our motto: "The patient first, ourselves—our professional judgment, second, and the dentist last."

We were taught the function of tooth forms and I am sure that every orthodontist was given a very different conception of how every tooth functions through its form than he ever had before. I am sure many of our dental friends can recognize the importance of better work else we would not see some of the things turned out by them.

I feel that we should work to secure better harmony and understanding between the different branches of all dental science. I feel we should have in the different branches give us papers and clinics so that we be better informed along those lines. Having given up the general practice we are more than ever to take less interest in other fields of efficiency unless we keep in close touch with their progress.

There has been some apparent trend for a number of years to separate orthodontia to such an extent as to almost isolate it from all other branches of the healing art. I believe this wrong. I feel our meetings are not held at the proper time of the year, neither should they be held at any other place than where the National Dental Association is held and then just previous to that meeting so that those of us who want to stay over and gain what we can from the other branches will be able to do so. As it now is, we meet in the spring, when a great many patients are getting ready to leave for the summer, and we are preparing "retentions" for many. It is true that the last meeting of the National was held at as poor a time, for our patients were then returning to begin active treatments, but that is a matter which could be easily adjusted if the proper spirit of cooperation could be established throughout our whole profession. There are difficulties within our own branch which would have to be met, such as avoiding confliction with the school period. Both as I view it, the school and the annual re-study period of the graduates are vital to the success of orthodontia and if the condition is general that spring conventions break in seriously on our yearly work, I am sure that if we but bring this to the attention of our members we would have their earnest cooperation to provide such arrangements that the general best interests all around are protected. The place and time for the National should be chosen and that time annually, and then we should precede it by a week.

You do not see the rhinologists, internists, surgeons or other specialists holding meetings at far separate times and places. There is a meeting of the American Medical Association and the sections are there divided, but any one can attend any section he chooses. The body they aim to treat is the same body we aim to treat. The body the dentist aims to care for is the same one we aim to care for.

I do not speak alone in this matter. I know that among our members there is a genuine desire to cooperate with our whole profession in our annual conventions. I know from talking with men in the general practice of dentistry that there is a feeling that we are disposed to be clannish—a feeling of resentment because we make no effort to cooperate. And they are not so much the losers as we, for our specialty demands a wider knowledge than is required of the general practitioner and we must keep pace with general progress in all branches. We can not attend both without providing for first two to four weeks for orthodontia and then in a few weeks a similar time for the National. We can not make all this time away from our offices without serious neglect of our patients. Neither can we afford to attend these conventions as vacations. It should be a period of work and study every day. Both health and efficiency of every practicing orthodontist is bound up in this general question of convention dates with the ultimate foregoing of needed vacation periods unless changes are made. I hope this subject will receive your earnest attention and that it will be freely discussed with the idea of coming to some definite understanding.

We should think more of the healthful results to the patient than to esthetic appearances, and in order to do this we must always carry the responsibility of what is being done for that patient; if we are to be fit to do this we must al-

ways be acquainted with all parts of the oral cavity and its relations to the rest of the body. If this is true, then orthodontia and dentistry are not as oil and water; they should mix and mix as butter and salt, a distinct something yet a vital part of a smooth bulk. There is a definite relationship between orthodontia and general dentistry which we can not deny if we are to carry into our professional practice the highest degree of efficiency.

I wish now to take up the future of orthodontia from the viewpoint of numbers. We know that the nation is seriously under-supplied, that, in several states there is not a single representative of this branch and that in no state is there an adequate number. We know that there are branches as yet untouched which should be under the direction of orthodontists but which must be neglected for want of men. We also know that ours is a branch which can not be entrusted to every man; it is the picked man, the man with special endowments who must be permitted to specialize. To those who are enthusiastic in their profession and who are awake to this great need, there is prone to be an enthusiasm which disregards the limitations which must be maintained in class enrollment.

Dr. Angle has demonstrated that in an eight weeks' course of study a foundation could be made for an orthodontist. He proved it by turning out such men as Dodson, Hawley, Watson, Young, Lourie, and many others. But he insisted that to do this he must not have overcrowded classes—that there was a limit to the number to whom the work could be given and concentration maintained.

I was one of a class of three to work under Dewey and I know that we three men made more models than any class of ten men ever made and that ten men would hold a like advantage over a still greater number. I know we were more concentrated than any other class. We had nothing to divert our minds when he was giving us a lecture, when he was making an appliance for a patient, each of us had room to see what was going on, we were not in each other's way when looking in that mouth. I am also sure with classes of ten or a dozen, no school exists where a stronger foundation can be laid than we received. I have often heard the remarks from men who had taken a short course in extraction such as this, "I guess he got it; I couldn't see; there were too many standing around in the way." Or perhaps this, "Well, I paid \$200 for the course and I never saw any of the work; there was too large a class."

I have discussed this phase of orthodontia with which I know you are all familiar because I have often listened to discussions in past meetings regarding the proper length of time for one who is desirous of becoming an orthodontist to spend in preparation. Two alternatives are open to us to solve this growing need for men and at the same time aid in preserving the high standard of efficiency resulting from intensive work with limited numbers. One is to have larger classes, but to lengthen the period of instruction sufficiently to allow for the slowing up of the class which results from overcrowding. If this is done, it can only be done with the loss of concentration. After a time the class loses interest, concentration can not be maintained either with the one in charge over the longer period or with those in the class.

The other alternative is to increase the number of terms, using the whole year if necessary, but still maintaining the eight weeks' program of intensive

training and sticking religiously to restricted numbers of those eminently fit to make the work. With such a plan all the benefits of the past methods of training would be retained for our profession and we would avoid the harmful results which would inevitably result if from demand from the public or from those of us who in the field plead for more men, the value of concentrated study would be lost through class enlargement.

This, to my mind, is one of the most serious problems before us. We all resist the spread of our numbers; we all insist that no set of circumstances shall force a relinquishment of the training methods which in the past have been fruitful of highest efficiency. In the field, we are scarce conscious of the tremendous demand for graduates and of the problem constantly confronting those trying to harmonize all these conditions. We who are gathered here are practical men, loyal in high degree to our teachings and our teachers and I hope if through frank and earnest discussion we can contribute constructive aid, we should, during this convention do so.

I wish now to consider the need of a definite code of ethics to govern our profession. It is my firm belief that we, as orthodontists, should deal more and more in the subject of prevention of conditions that we know will result without proper care. In the past we have dealt some in etiology, and the proper age to begin our treatment of correction. Most of our work has been along the lines of appliances and the final esthetic appearance of the teeth. This was necessarily so for in the establishment of a profession there is urgent need of immediate returns. But we are no longer in the formulative stages of professional growth and if we are to establish our worth to the generations we must make as the by-product of our labors, not the greatest return in the shortest time, but the greatest good. We are but following the beaten path of medical experience; the successful physician, the worth-while physician, now looks as much and more to the prevention of disease and malformation as to its correction afterwards. And orthodontia has not suffered one dollar in reward. In fact he has clothed his profession with greater dignity and built up for himself a happier field of work than the surgeon when he formerly faced only distorted and diseased patients. We may well profit by their example. The true scope of orthodontia is to prevent as fully as it is to correct.

I can not too strongly urge you to avoid the narrowed vision that seeks only the immediate gain. We can not justify our specialty unless we conform it to the other great healing arts which seek to build up a healthier race not through attention to the diseased and deformed but by education and watchful care under which the race develops straight and true. Can we not make some arrangement with our medical and dental friends to borrow every child, say from the time the first tooth erupts, until the child is 12 years old? I am sure that if we do, we can see that the teeth are kept clean, that tonsils and adenoids are removed where necessary, that proper diet is advised and then through our corrective facilities that proper digestion is secured through teeth which function as Nature intended. If we can only secure this result, we can feel that the child is our ward, not our source of profit only, far greater results will be obtained than could ever be through merely corrective practice.

Many states through their Departments of Education provide for dental attention in schools wherever possible, but unfortunately this supervision is invariably by members of the restorative branches, practitioners without a knowledge of needs made clear by our science. It is my hope that the day may come when the need of attention to the child during the period of teeth development may be made the duty of an orthodontist as the chief inspector because of his special training and ability to recognize early conditions that might be very detrimental to the child's future.

We all know what happens to the mouth of the child who is allowed to suck her thumb or pacifier; we know what results when the temporary molars are allowed to decay and become abscessed. I have recently seen a record of the white blood count from many little children who had abscessed teeth, the count being made just before the teeth were extracted and from 24 to 48 hours afterwards. The difference I am sure would make many of you open your eyes and in the future keep your ear to the ground to catch the next case before these conditions occurred.

Our societies have always aimed for the best as the best was understood. Appliances have held the center of the stage always. True, if they hadn't, we would not have the beautiful, clean, and comparatively comfortable attachments we have today. Yet, I am sure that what we have now will surely correct any malocclusion we may be called upon to treat, and I am convinced that we should now turn the spotlight over to that portion of the stage marked "Prevention." It is the biggest thing in the healing art today. There are so many ways in which we as orthodontists can prevent malocclusion. If we can get the little child in the period of eruption of the deciduous teeth, we can then see that the teeth are properly cared for; not only will the permanent teeth be apt to erupt more normally, but the very health of the child will be benefited. What does a beautiful set of teeth amount to if the owner through earlier neglect has been broken in health?

I believe the majority of our men are too busy to do the necessary cleaning, and if this is so, we should all have with us in our offices either an assistant or associate whose entire time could be devoted to just polishing the little fellow's deciduous teeth.

We have a few practicing nothing but pediadontia, and they are the savers of thousands of cases that without doubt would otherwise result in deformities. These deformities, of course, can to a great degree be corrected by orthodontia, but would it not please us as much or more if we could prevent to a large extent a great many of these cases?

From the actual standpoint of dollars and cents, if we insist on answers in those terms, would we not be able to receive as much from each case by having a dental nurse keep these teeth clean, thereby saving the teeth from cavities and the resultant loss of tooth structure, which is perhaps as great a producer of contracted arches as any one factor with which we have to deal?

At the same time we are removing this cause of malocclusion, we could save the child from the danger of abscessed teeth and the resultant effects of focal infections on the system as a whole.

Many states have already recognized this need of trained nurses for our professions and have made provision whereby we can engage nurses who have had training along these lines.

I feel deeply that we as men who do and should come in contact with the early life of humanity should at every opportunity encourage the preventive side of our profession. I should like to have our society discuss this subject with a view of definite expression and definite results more, far more, than we have ever done in the past. No profession can long exist without a fundamental ideal, a vision of a greater goal than the mere acquirement of money. We who have been chosen for special fitness to serve in this advanced field of dental science must above all others shape these ideals. So long as we strive only to the corrective side, we limit our field of usefulness. To reach our fullest measure of service and value, we must recognize a call to service not only to the malformed but to all the coming generation that may avoid those conditions—our large field for lasting service must be more and more in the cause of prevention.

Gentlemen, to my mind, one of the great functions of a convention of this kind is that it may serve as a clearing house of all the ideas and progress which our members have experienced. In the brief time we are together we have scarce time for else than the most vital and important of the matters which confront us as an organization and as a profession. I have tried to outline before you the main problems demanding our attention as they have appealed to me. For the sake of clearness I wish to just briefly review them for you. I believe that we must understand the history of hard work and sacrifice out of which our profession grew, holding that such understanding is necessary if we are to fulfill the personal obligation which each orthodontist holds to his society and his specialty.

I feel that three special problems stand out above all others in urgency and in my paper I have confined myself strictly to them. I believe first that we should seek to create a closer cooperation between ourselves and the other branches of dentistry,—that this is needed if we are to keep informed on their progress and be the dental expert that success in orthodontia exacts. I believe that of fundamental importance to this end is a change in the time of our society meetings so that they harmonize and ally themselves with the annual meetings of the National or vice versa.

My second point was that a definite policy regarding the increase of our graduates should be discussed and adopted; that in establishing such a policy we should recognize the crying demand for more men in the field, but that we must preserve religiously the class system of the past which through limited enrollment over a period of eight weeks of intensive work has been fruitful of such satisfactory results. And in conjunction with this I pointed out that if we did increase the numbers, the only feasible plan was to increase the number of terms.

Finally, I spoke of the need of a definite code of ethics for the profession. This itself an outgrowth of the other two, must find expression in greater attention to the almost undeveloped side of preventive orthodontia as well as the corrective. In fact, we will reach our greatest measure of worth when, and only when, we have made corrective practice the last resort, the safeguard to be resorted to where preventive treatment has not sufficed or where ignorance has brought the patient to us after the damage was done.

It is my earnest desire, gentlemen, that this program will receive your support, your thought, your honest comment and discussion. We can not reach perfect orthodontia a day even if the making lay within ourselves. We are confronted by a problem still, because we must carry the public with us by intelligent education along these very vital lines. Orthodontia can not be established alone from the efforts in our offices. We must carry our message to the people till we bring it not a luxury to the public, but a necessity demanded by legal enactments—the case of trial as the last resort after the general restorative practitioner has failed and the court of first resort where the public turns earliest for aid and guidance to avoid, as well as correct, the ills to which mortal man is subject. The danger in any profession is that the individual becomes narrowed in his specialty. Our success rests entirely on our ability to avoid this thing. Orthodontia is synonymous with efficiency. We can not be efficient unless we do provide for efficiency. We can not be efficient unless we do provide for a proper coordination with the other fields of dentistry, unless we preserve as requirements of all future graduates into our ranks the highest standards, unless we recognize that our great specialty rests not alone on correction, but equally if not more, upon the great field of prevention. I believe these problems wait above all else the consideration of this convention.

DISCUSSION

Dr. Sidney W. Bradley, Ottawa, Ontario.—The president has delivered a splendid address. I congratulate him on his enthusiasm, his high ideals and the excellent embodiment in the paper. I can agree with practically everything he has said.

In regard to holding our meeting before the National Dental Association I think this idea is a good one, provided the American Society of Orthodontists would do likewise.

I did not receive a copy of the address in time to prepare a formal discussion, but I looked over it this morning. I think every essayist should supply those who are to discuss his paper with copies of the same in advance of the meeting. Then the paper will receive careful discussion and thoughtful consideration. It is impossible to do justice to the address of this kind by any impromptu remarks. Every one of us who has traveled from 200 to 3000 miles to attend these meetings does not want to hear impromptu discussions. Carefully prepared discussions might be given if the essayists supplied copies of their papers previous to the meeting to those who were on the program to discuss them.

I believe that there should be closer cooperation between the orthodontists and the general dental practitioner, especially with reference to the matter of extracting temporary teeth. Most members of the dental profession in general practice are only too willing to let us decide that, and there is no person better able to decide than the orthodontist. The temporary teeth should be extracted.

I thought of a few ideas yesterday while coming here and they are practical and the same as those set forth by Dr. Weeks. Article II of our Constitution says that the object of this society should be to advance the art and science and literature of orthodontia; to foster fraternal relations and intercourse among its members; to safeguard their material interests and the interests of the public; to elevate the standards; and improve the methods of orthodontic education.

These are high ideals, and we could not do better than live up to them, promote fraternalism among our members, promote sociability; to have a common ground where we may meet and discuss the latest and best in orthodontia.

After all, the public is the judge of our successes and failures, and the public, speaking generally, is a pretty good judge. If the members of our specialty can not "deliver

goods" we have no right to exist as a specialty. If we do good work and are useful to humanity, we have a right to exist as such.

Take the older members in orthodontia, they are watching the Dewey graduates closely, and if we make a success we shall do honor to our school. It is true, as Dr. Weeks has said, an eight weeks' course will not enable one to become an orthodontist. All such a course can give us are the primary principles for laying the foundation. We must study diligently after we graduate, and if we do that we will be a success. If we love children and the Lord intended us to be orthodontists, our success is assured. How is that for predestination?

We must realize in our practice that mechanics alone will not make an orthodontist. We must study the underlying principles, the physiologic properties of active growth, rest, and development. We can do this best clinically at the chair.

Our science is only in its infancy. I believe that the next ten years will see a great change in both methods and appliances. Every appliance Dr. Angle has brought out is used extensively, but I think most men when they use those appliances a few months try to improve them to suit their own personal ideas. After all, the personal equation is an important factor in our work. An appliance which suits one may not suit another without modification.

I know we are going to have a good meeting, and I trust every one will take part in the discussions. If any of you have a good idea, do not sit in your chair afraid to give it to others because of false modesty or timidity. If you do not give the rest of us your idea, we will lose the benefit of your experience.

Dr. J. Frank Nelson, Chicago.—It occurred to me when Dr. Weeks was delivering his address that it must have been very difficult for him to write it. I have felt that this was a rather harmonious, almost perfect, organization. We seem to get along very well together and are making considerable progress. We have proof of that in the Dewey Alumni. I feel deeply along these lines and am gratified to see that we are so harmonious.

I have enjoyed Dr. Weeks' address very much. The points he has brought out are interesting. He delivered an eulogy on Dr. Angle and Dr. Dewey. I am sure we all agree with him regarding these two men.

He spoke of our relations to the general practice of dentistry. It occurred to me at the time he was speaking of that point that it would not be a bad idea, if we have any right to do so, to require men entering the practice of orthodontia to have from five to ten years general practice. This would give them a better knowledge and a broader view of what the general dentist is doing by reason of his experience, more than any other way. I do not know what the requirements of the school now are, but I think it would be a good idea.

Dr. Weeks spoke of the time of holding our meeting. The meeting of the National Dental Association at the present time is an enormous thing. The only argument I can think of which seems to me to be a good one in that regard is that it will permit us to take in everything at one meeting. We would not have to leave home but once in a year, if we had all these meetings at the same time. If we are going to ally ourselves with the general dentists at these meetings, why not go a step further and have the general dentist and the orthodontists, the physician and rhinologist meet at the same time. I think the argument is feasible. In my experience, I have been closely associated with rhinologists a few times, and they are working along lines close to ours. I do not know of any other argument against meeting with the National Dental Association except that it would be too large.

President Weeks spoke of the importance of our studying prophylaxis and of paying special attention to prevention. I think that is a very good point. Every orthodontist should be thoroughly familiar with what the periodontologists are doing. We have children under our care at a time when they are most susceptible to impressions. If we can get them to form habits of mouth hygiene and cleanliness at that time, they will remain with them the rest of their life. If we can show them two or three times a month how

to care for their mouths, and have the opportunity to see the children at regular intervals, we can do both the prophylaxis and regulating. We should pay special attention to prophylaxis. Orthodontia really is, in a measure, prophylaxis.

As to the size of our classes and the conduct of the school, I am not familiar with what our president desires in his recommendations or suggestions as to the policy of the school. I know we need more orthodontists. Possibly it would be better to limit the size of the classes and increase the number of sessions during the year, or take all the students who come into the class, as many as wish to come in, and increase our capacity of the school. Dr. Dewey can lecture to 100 men as easily as he can lecture to one. I think the size of the class makes very little, if any difference to him and the only change necessary would be to increase the number of demonstrators and make some change in the conduct of the technical part of the work.

However, I do not know that we have any right to dictate the policy of the school, although I am sure they will welcome suggestions from the alumni.

Speaking of getting an opportunity to see the mouths of very small children, I think we should try to have these children under observation from the time they are two or three years of age. That is all right as an ideal, and it might be worked out in a limited way, but I can not see how we are going to be able to get hold of a great many children at that age. It certainly would be the ideal way to practice orthodontia, and we could do a great deal of prevention if we could guide a lot of teeth into place, and in that way avoid malocclusions.

I enjoyed Dr. Weeks' address very much, and would be very glad to join the society in making recommendations along the line he has suggested.

The Chairman (Dr. Oliver).—A great many points have been brought out in connection with this address which I feel should be discussed freely. Each man here should feel that this is a large family reunion, and any man should feel himself free to discuss this address. No man should keep his seat if he has some good ideas to bring up. I sincerely hope you will discuss not only this paper freely, but that you will feel at liberty to discuss any paper that is to be read and bring out as many good points as you possibly can. We are here to learn. This address is now open for general discussion.

Dr. F. C. Rodgers, St. Louis, Missouri.—I deem it a privilege to take the floor on this occasion because I am not a full fledged member. I hope to be in a short time, at the next session of the school.

The president's address is so full of good ideas, so full of excellent points that urgently need definite action, that they should not be passed over as I have seen in the past when presidents have made recommendations in their addresses. They have simply been forgotten after the meeting adjourned.

Dr. Weeks certainly has analyzed the situation of the orthodontic profession in relation to general dentistry, and it is that point I wish to discuss from a constructive standpoint, particularly the possibilities of orthodontists in a constructive way, and what they can do for the general dental profession. Dr. Weeks mentioned some of the objectionable features with which the orthodontist is confronted, namely, poor restorative work on the part of the dentist, and what is the orthodontist going to do in cases of that kind? We can not return a patient to the dentist with our personal observations and criticisms of constructive work; we can not do that, although it is our duty in reality to do so, because we must consider the good will of the dentist as well as the good will of the patient for that dentist. Remember, we antagonize not only the dentist to the orthodontist, but we antagonize the patient to the dentist if we criticize his constructive work. Although this criticism may be justified in the light of the patient, the patient will realize that work is not properly done, if it has to be done at the recommendation of the orthodontist.

Is the dentist capable of doing better constructive work than he has done? It has been my experience that the average dentist does the best work he conscientiously and technically can do; I have reference now particularly to the class of dentists who recommend patients for orthodontic treatment. It has been my experience, and I have no doubt it has

been the experience of those present, that work which is improperly done in the mouth, if the patient is referred back to the dentist, will eventually show very slight improvement, if any. I have referred back cases to dentists where there were amalgam restorations in the teeth, with the recommendation that gold restorations should be made, and the patient has returned in course of time with inlays, with overhanging margins, with poor contact, poor occlusal restoration, and the restoration was really worse than the amalgam.

The same thing obtains in crown or bridge work. I have particularly in mind a recent case where I separated the cuspids from the centrals, where there were two missing laterals, congenitally missing. I gained sufficient space for the lateral to use an artificial substitute, and I returned the case back to the dentist for restorative work. The patient came back with artificial substitutes of laterals in place, fastened by clasps to the cuspids with a bar across the lingual surfaces of the centrals, but the position the laterals occupied in relation to the occlusal plane of the teeth and the gingival margin of the gum was really disgraceful. I thought to myself that the case looked more unsightly with these artificial substitutes than the original model showed it to be with the cuspids in close contact with the centrals. That is an illustration where the orthodontist is helpless to dictate what to do and how to do it, to the dentist.

But there is another angle we should consider in connection with this constructive work. I will relate briefly the constructive work that is being done in our city by the orthodontists in preparing the dentist to do better work. We all know the shortcomings of the dental curriculum in teaching general dentistry. We know the limitations of the great mass of students. We find that the students are incapable of carrying out the technic taught them by their teachers, but the majority of the students have sufficient technic to pass requirements of the State Dental Board and faculty of the school, and at the examination they are not given an ideal case, that is, to insert a filling, or make a crown, or construct a bridge for a State Board examination. There is a deficiency in dental education. There is a lack which is demonstrated in the future progress of the average dentist.

It is within the power of the orthodontist to do some real constructive work in overcoming difficulties or in helping out the dentist.

Postgraduate courses are given in the City of St. Louis free to the dentist, and they have an enrollment of 145 dentists attending this class, and the progress that has been made in a constructive way in dental technic is really remarkable. That is constructive work that the orthodontist can institute in his own home wherever he is located. He can organize study clubs among dentists, not in orthodontia, not for the purpose of giving clinics in orthodontia, but organize study clubs among dentists to teach them dental technic, root canal construction. From the beginning of a small sized study club of six original members, the club has grown in membership in one year to 146 bona fide enrolled students. Teachers volunteer their time; the best teachers available are selected to act as instructors and to conduct such clubs among the members of the schools. That is something constructive to the orthodontist, it is something he can do, and it will redound to the credit of the orthodontic profession, I know that from experience.

Those of you who attend the state meeting of Missouri will see a clinic given there by the study club which will be not only a surprise to the dental practitioners in Missouri but to any one who is privileged to attend the clinic. They are doing remarkable work along the latest ideas in reparative dentistry. The subject of orthodontia is not mentioned in any way, but it is the desire of the dentist to cooperate with the orthodontist in regard to extracting deciduous teeth, and the dentist should always consult the orthodontist before extraction, and so on. The real work is accomplished by teaching the dentist to do better dentistry, and then we will eliminate some of the difficulties we have to contend with and concerning which at present we are helpless.

Dr. Lourie J. Porter, New York City.—Dr. Weeks spoke about holding our meeting in connection with the National Dental Association meeting. In respect to that, I do not think we would have the concentration in orthodontic work, if we held our meeting at the same time as that of the National Dental Association. The argument has been advanced that there are a number of men, orthodontists, who are interested in the general profession

and give their time during that week to the dental profession regardless of orthodontia. If the two meetings were held together it would virtually mean two weeks, and as a rule in that time we would get tired. If our orthodontic meeting was held separately, or the week before the National Dental Association, we would have a chance for greater concentration on our work in orthodontia, and we would not have to stay for the meeting of the National Dental Association unless we felt like it. It seems to me better not to hold these two meetings together.

Dr. O. H. McCarty, Tulsa, Okla.—Many of the gentlemen here evidently live where it is convenient for them to attend both the National Dental Association meeting and the American Society of Orthodontists. On the other hand, there are some of us who live across the country, in the southwest, where we have to ride long distances to attend these meetings. Our income is not great enough to make both of them. It is impossible for some of us to reach all of these meetings when they are held at different times of the year. Why not have them meet at the same time, as Dr. Weeks has suggested? Most of us I think would like to have both meet as nearly as possible at the same time.

Major Jos. D. Eby, Washington, D. C.—If you will pardon my digression for a moment from the address which our president has so ably delivered, I would like to answer one question which all of my friends whom I have met this morning have asked me.

I have remained in the army because of many attachments to the service including devotion to the dental corps as the representative of modern dentistry, which must exist on as high a plane in the army as elsewhere, interest in our remarkable clinic at Walter Reed U. S. Army General Hospital and particularly for the maxillo-facial patients and from whom we are beginning the final compilation of records so as to permanently record all of the principles employed in their treatment.

I feel that as an orthodontist, this work is a particular obligation by virtue of the fact that all of the principles of successful procedure are founded fundamentally in the basic principles of orthodontia and I trust that my work will reflect the fact that if one adheres consistently to orthodontic principles, he will not depart far from the best results, this I state in interest of the fact that it behooves all of the younger members of our great specialty, as highly trained and specialized men, to realize that they must be efficient in this phase of orthodontia which abuts oral surgery, and as a matter of personal pride at least, be prepared to serve in this capacity wherever necessity demands.

Col. Robert T. Oliver, chief of the Dental Section of the Surgeon General's Office, called me to his office before my departure and instructed me to convey to you his best wishes and to elicit your good will and interested cooperation in the work which he is doing for the accomplishment and maintenance of the very highest standards of dentistry in the army.

I wish it were possible in connection with all of the thoughts which I have presented, to impress the remarkable possibilities of the orthodontist in the maxillo-facial field, and if you would only grasp confidently, my perspective, it would induce you to enter the Dental Reserve Corp wherein you are capable of rendering a great service to our country and profession, not to speak of the patients whose good fortune it would be to be placed under your care.

I am sure that if you will address Col. Robt. T. Oliver, care of the Surgeon General's Office, Washington, D. C., and request information for status in the Dental Reserve, as orthodontists, your letters will receive most pleasant attention.

Our president has presented many of the most serious points which interest modern progress in orthodontia, points which require digestion and thorough discussion.

Personally, I am undividedly in favor of the proper development and license of Dental Hygienists, provided their sphere is properly defined and regulated. I believe they can be developed as one of the most valuable assets in a large practice of orthodontia.

The greatest subject which our president has touched upon is the question of education and it goes without saying that the Alma Mater, backed by this august Alumni, must be the forerunner and fulfill all of the demands which progress may impose.

I wish to compliment Dr. Weeks upon his clear vision in the selection of the topics in his address and their splendid presentation.

Dr. R. L. Webster, Providence, Rhode Island.—I agree with the president as to the point of maintaining small classes. I was in a class of six with Dr. Dewey, and I was much impressed by the individual instruction which we received. I understand there were thirty in the last class, and I think if Dr. Dewey had it this way, there were good reasons for so doing. I should like to hear from Dr. Dewey himself on this point.

Dr. Martin Dewey, Chicago.—I read Dr. Weeks' address yesterday, and some of the things in it I agree with. I hardly know how to take up the subject that has been mentioned because there are so many things to be said on both sides.

In regard to the time of meeting, that is something that will never be satisfactorily settled so as to please all. Judging from past experience of this society and the American Society of Orthodontists, I think you will have a better meeting if you will meet by yourselves. As to the remarks of my friend from Oklahoma, there are some members here who have had to travel as far as he has; therefore, the question of expense should not enter into it to a very large extent. What is the best for the greatest number should be the motto. I know you can not hold a meeting at the time of the National Dental Association, or at the time of the meeting of the American Society of Orthodontists, as you can by yourselves. You will lose a certain amount of individuality by meeting with the National Dental Association. The American Society of Orthodontists tried that a few times. The majority of the members here do not want to be the tail to the kite.

In regard to the size of the class, there are a great many things to be said in favor of a small class and also in favor of large classes. So far as my work is concerned, that would only be one thing in regard to the question, but you have to consider the fact that it is only at a certain time you can get the faculty together. You can not call the faculty together any time you think or wish. It is necessary to plan a year ahead for the course. We take a certain number of students because it meets the men's requirements. When we gave two courses a year in Kansas City most of the work was done by myself. As a result of that it was called a "one man course." To get away from that we secured a larger faculty. To have the faculty we can have but one course a year. There is question of equipment and facilities to consider. One must have a suitable place to give the course, and that is a well-equipped dental school. These things can not be secured in a short time or at any time they are wanted.

This question will probably be explained later on at some other meeting, because I know some of you wonder why we have done certain things, and why we did not do something else.

As to the size of the class, probably we can arrange to take care of a class of thirty or forty. With the corps of instructors we are planning to have we can take care of one hundred as well as a class of six.

With regard to accepting men for the study of orthodontia, it is a ticklish question. Who is going to decide the fitness of a man to take up orthodontia? I can remember very well what Dr. Angle did in regard to that. If he did not like a man he would not let him study orthodontia. He tried to decide who should and who should not study orthodontia. If a man is a qualified dental practitioner, that is as far as we legally can go. If in the beginning of the course we feel that a certain man is not suited for orthodontia or can not be an orthodontist, and would be a discredit to the school, we will give him back his money and turn him loose as we did last year. That is the best we can do, and that is what we intend to do if a fellow is not going to be an orthodontist. We will give him his money back because it will be a protection to orthodontia and to the school.

As to a man spending five years in general dental practice before he takes up the study of orthodontia, that is an important question. Dr. Angle made a rule that no one could enter his school who had been in general practice for seven years. I do not think it makes much difference whether a man has been in general practice five years or not, because the student or man can be just as big a fool at the end of five years as he was in the beginning. (Laughter.) So from personal experience we find such a rule works

both ways. The young graduate has some advantage over the man who has been in practice a number of years, and the older practitioner has an advantage over the young man by his increased years of experience, but so far as deciding the question is concerned, it lies with the individual himself, and the number of years he has been in practice may not count as much as one would think.

The president mentioned the question of dental nurses which finally resolves itself into the dental hygienist. As we have another paper on that subject which I am going to discuss, I will not say anything further at the present time, but the question of dental hygienists will have a reaction that I do not think the majority of you realize.

Dr. Thomas T. Moore, Jr., Columbia, South Carolina.—Since the size of the class has been mentioned, doubtless you would like to hear from one who was a member of the largest class ever graduated in orthodontia. Last year there were 35 of us I believe, and I wish to give my personal testimony to the effect that if any member of that class failed to get all that was intended out of it, it was largely due to himself. I am sure we accomplished about as much as you would in a smaller class.

So far as getting all of the instruction we possibly could in orthodontia, I feel perfectly sure that if there is anything I did not get, it was due to me, and not to the school.

Dr. Weeks (closing the discussion).—During the discussion I took a few notes, and I will try to take up the points in the order in which they were mentioned. Dr. Dewey and I disagree. If Dr. Dewey did not have the spirit of disagreeing when he has very set convictions on any subject, I do not think we would like him as well as we do. He is full of fight, and for that reason we like him.

As to the time a person would be best fitted to take up the study of orthodontia, notwithstanding what Dr. Dewey has said, I still believe that the man who contemplates taking up orthodontia as a specialty should have some years of general dental practice before he gets into the specialty of orthodontia. He has never seen what the results are from personal experience in dentistry until he has been five years in the field of general dentistry. He has not had education along the line of handling the public, and I feel that my experience in general dentistry aided me very materially when I left it entirely and took up the practice of orthodontia.

I still believe in small classes. While Dr. Dewey can get assistants, and can get demonstrators, yet in the end there is only one Dewey to lecture. I have seen some classes in which some member of the class was not interested in the lecture, and he would lounge around, perhaps go to sleep, and snore during the lecture, and disturb the other members in a class of ten. Now, in a class of thirty or forty there would probably be two or three fellows who would either snore or talk. When there are two or three talking, you may depend there are five or six who do not get as much out of the lecture as they should, and so the smaller the class the greater the concentration, in my estimation.

Major Eby has expressed my feelings all the way through. There was one point brought out which reminded me of a remark made by Dr. Oliver. We were at lunch yesterday and he spoke of making history cards. We know very little about the etiologic factors that produce malocclusion. I think Dr. Weinberger has gone into that more than any other one man, and still we know very little about it. If a committee could be appointed to draw up a history card, so that there will be plenty of questions to ask the parents and go back as far as we can and everybody is supplied with these cards, if such records are kept say for five years or more, and then hand these cards to the committee to use, I am sure we will have valuable material regarding the etiologic factors of malocclusion. We would have something definite.

There was quite a little said about the meeting place. I did not say that we should meet with the National Dental Association, but that we should meet prior to that society so that those of us who wished to stay over and attend the meeting of the National Dental Association might do so.

Dr. Rodgers said that we should not talk to patients regarding the work done by dentists. That is right. We should turn to the dentist who referred the work to us and talk to him. If you find a straight wall covering a crown without any chance of bringing

about normal occlusion with that, and the dentist refuses to remove it or do it over, it shows that he has not a true sense of his responsibility to that patient or he is not capable of doing better work. It is our duty and our responsibility to give such a patient the best.

Dr. Nelson spoke about whether he had any right to suggest or criticize the Dewey School. That school is ours. We can make or break the thing. It is true that Dr. Dewey is at the head of it, but we are ahead of Dewey now, and I think it would be better if every one of us would go right straight to Dr. Dewey and make any suggestions to him we think proper, and while we may disagree with him we are all friends. He likes us to know what is taking place on the outside. We have ideas that come to us that we should give to him. He will welcome them.

As to the dental nurse or dental hygienist, I do not care whether you call her a lady nurse or a dental hygienist. I believe we should take the responsibility of preserving the deciduous teeth.

I want to apologize to Dr. Bradley for not sending him a copy of my address, and the reason I did not do so was because I had not finished it.

The idea has just occurred to me that I have not dealt at all on the subject of ethics in regard to appliances used by different men in our society. I would like to say this: there are wonderful results gained by every man in this room, and furthermore all over the country.

Because a man is in New York, he is not better able to correct malocclusion with the Jackson idea than the man in Los Angeles is with the Angle pin and tube. Neither is the man in San Francisco a better man because he uses exclusively the pin and tube affair. The man in Chicago or Tennessee can produce as wonderful results with the 19 gauge lingual arch. It seems now with the great variety of appliances in use by different men and the beautiful results they are gaining, that for the man in California who may be using the pin and tube idea, to receive a patient from another member of our society from another section of the country, who uses a lingual or other appliance, and say to the patient or parent that the appliance in use is not right and thus and so should be used, only makes it very clear that that statement comes from the man only slightly educated in orthodontic principles, and it behooves the best to respect even the beginner; he may put something over that would be embarrassing to some one.

THE RELATIONSHIP OF FORM TO POSITION IN TEETH AND ITS BEARING ON OCCLUSION*

BY MILO HELLMAN, D.D.S., NEW YORK CITY

THERE is a prevalent tendency in our specialty to worship an ideal which by tacit but unanimous consent has been declared the goal of orthodontic attainment. The conception of this ideal, though expressed by the term *Normal Occlusion*, implies qualifications of such exacting character as to render its probable occurrence under average conditions exceptionally rare. Despite the short definition by Angle on the one hand and the elaborate and highly philosophic treatise by Johnson on the other, the exact meaning of normal occlusion has baffled the profession to such a degree as to bring about considerable confusion relative to the *practical results* obtainable by orthodontic procedure. To illustrate, an instance will be cited.

Among other casts of cases of malocclusion in my collections, those represented in Fig. 1A, were observed by an orthodontist. The first utterance made was: "abnormal frenum." To the query how he would treat the case he answered, "Well, I would remove the frenum by the electric cautery, and draw those centrals together." These casts are of the denture of a man over forty years of age, it was explained, and as may be seen by the illustrations (Fig. 1, B, C) the teeth are in normal occlusion. "Would you really treat such a case?" he was asked. "Indeed I would," retorted he.

Another instance, quite illustrative, is the invention recently brought to the attention of the profession which, it was claimed, may enable the orthodontist to detect any deviation from the normal in occlusion of a denture to the extent of a fraction of a millimeter. The practical utility (?) of such an instrument is undoubtedly obvious, and yet, its importance was so persistently urged on as though the solution of all orthodontic problems depended upon its adoption in practice by the profession.

Of similar interest is an occurrence met with in practice so peculiarly impressive as to have a queer effect upon the disposition of the most temperate of individuals. No orthodontist can deny the heartfelt disappointment, when at the expiration of extensive periods of time devoted to the treatment of a case of malocclusion, after cautious and careful retention for months or even years, the patient returns shortly after the removal of the last vestiges of the retaining appliance with the following remarks: "Doctor"—and placing the forefinger upon a certain tooth—"I can feel this tooth sticking out; are my teeth going back?" He is horrified by the thought of the prospects. For, according to previous arguments, irregular teeth get worse if they are not corrected. He tries to minimize the extent of the damage; but, as the facts in the case are undeniable, he is at a loss for a plausible explanation. Some orthodontists attribute the

*Read at the Annual Meeting of the American Society of Orthodontists, St. Louis, Mo., April, 1919.

relapse to one cause, others to another, but pretty nearly all agree upon the necessity of correcting it again. As a consequence, the *ideal* orthodontic results obtained are apparently short lived. It has been my privilege to see several cases presenting ideal results as obtained by some of the leading men in orthodontia. But when asked how long the appliances had been off they said about six months.

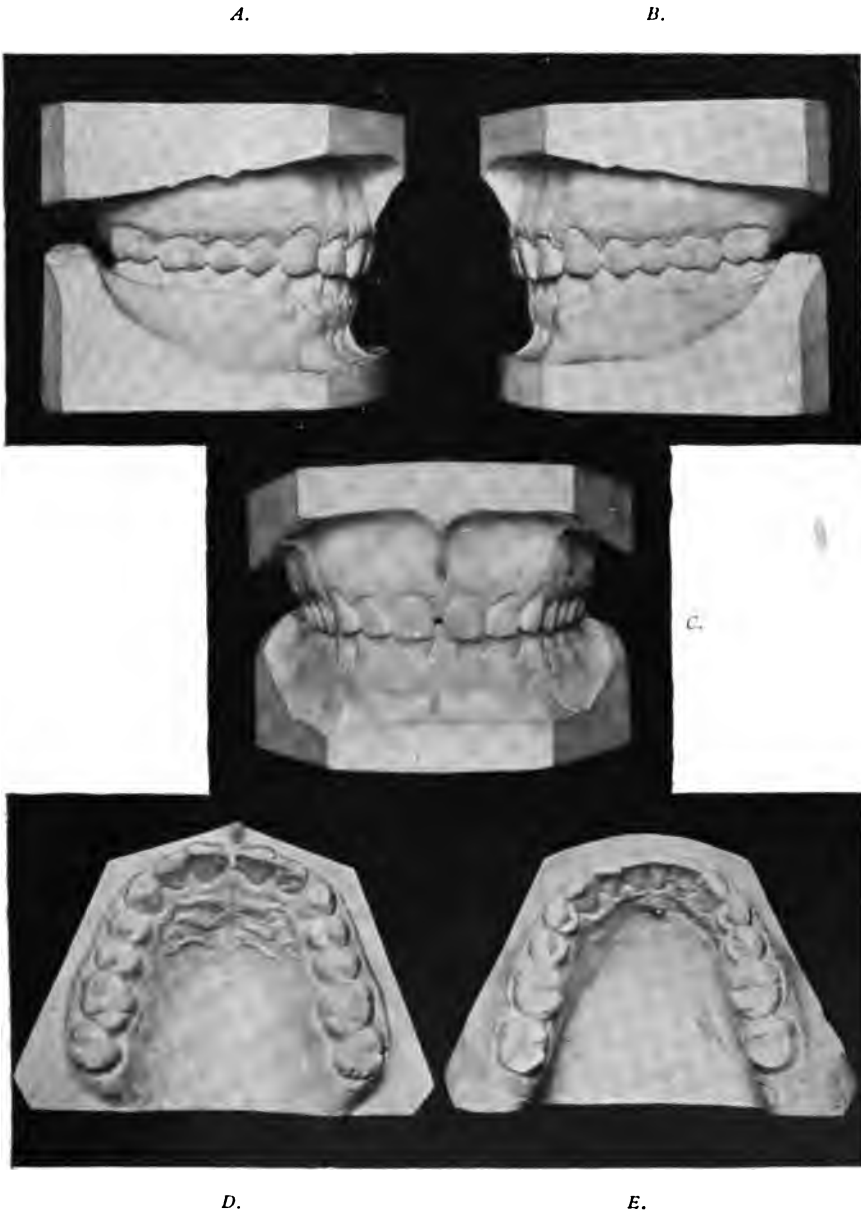


Fig. 1.—Casts of dentition of male of forty. A.—Front view, showing small diastema between upper central incisors, with somewhat excessive overbite. B.—Right side view, showing normal occlusion of premolar-molar series. C.—Left side, showing similar conditions as in B. D.—Occlusal view of upper dental arch, showing diastema between upper centrals, position of mesio-distal axis of central and laterals as compared with those in Fig. 27, the three-cusped second molar and missing third. E.—Occlusal view of lower dental arch, showing position of incisors, canines and premolars in their arch curve differing from that in the teeth of the upper arch; also notice the right third molar in the course of eruption.

These instances illustrate first, the extremes to which the conception of normal occlusion tend, and secondly, the demands upon which this conception is based. Thus, the exacting nature of such demands render even the ablest, most expert and conscientious of orthodontists not *always* sufficiently competent to obtain in *all* cases *lasting ideal results*. By this is meant, of course, results that would simulate the *conceived ideal*, years after all appliances will have been discarded, and all the teeth shall have adapted themselves to the tasks imposed upon them by the various habits involved in the mastication of food, in the respirations of air, in the enunciation of speech—and by other habits that are so liable to spoil good orthodontic results.

To disillusion ourselves from idealisms and gain an understanding of the scientific aspect of occlusion, it is necessary to relinquish all notions of abstract phenomena and resort to a study of the concrete manifestations in Nature. How many of us are familiar with the results obtained by nature through her per-

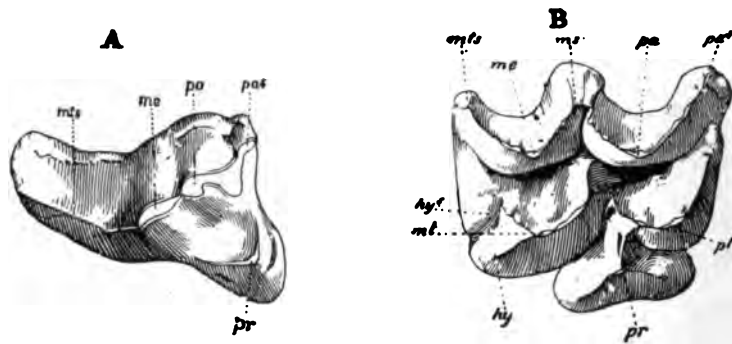


Fig. 2.—Two teeth, showing divergent derivatives of the tritubercular molar pattern. A.—Sectorial molar of *Oxyæna* of the Eocene period. B.—Grinding molar of modern horse; pr, protocone; pa, paracone; me, metacone; hy, hypocone; pas, parastyle; mts, metastyle, etc. (After Osborn.)

sistent and ceaseless efforts in the endeavor to produce an efficient masticatory apparatus throughout the animal kingdom? How many of us appreciate the fact that in order to produce the form of teeth constituting the human dentition required millions of years in time and innumerable experiments on the part of Nature? Also the ingenious manipulation and endless experimentation it required to place each tooth in its allotted position in the dental arch of man? For instance, obvious as the difference in form of the two molars in Fig 2, *A* and *B*, may appear, it requires a keener perception to appreciate the character of divergence in their morphologic modification. For, although one molar (*A*) is a sectorial tooth of a carnivorous animal (*Oxyæna*) of the Eocene epoch and the other (*B*) the grinding tooth of the modern horse, representing types adaptively so far apart as to confuse even experienced odontologists, "the existence of homogeny or common derivations through which we can now compare cusp to cusp" (Osborn) is plainly evident.

It must, therefore, be granted that only upon a thorough appreciation of these facts will we realize that although we have learned, as orthodontists, to produce changes in position of the teeth in the human jaws, we are utterly incapable to bring about the slightest modification in their form. And, whereas

there appears to be a relationship between form and position in teeth, as is borne out by abundant evidence, in evolution and in comparative anatomy it is well to remember that in all orthodontic procedures this factor plays a role of considerable importance. Furthermore, since changes in form are entirely beyond the control of the orthodontists, the position of the tooth should be based upon an interpretation of its form. Such interpretation, on the other hand, must necessarily depend upon a knowledge of the natural processes that were instrumental in originating, shaping and placing the teeth in the positions as found under normal conditions.

The subject, therefore, resolves itself into studies on:

1. Evolution of the Mammalian Molar Teeth and Its Bearing on Occlusion.
2. The Number, Form, Position and Occlusion of the Teeth of Modern Placental Mammals;
3. Evolution of Form and Occlusion of Primate Teeth;
4. The Form, Position, and Occlusion of the Teeth of the Anthropoids;
5. The Form, Position, and Occlusion of the Teeth of Primitive Man;
6. The Form, Position, and Occlusion of the Teeth of Modern Man.

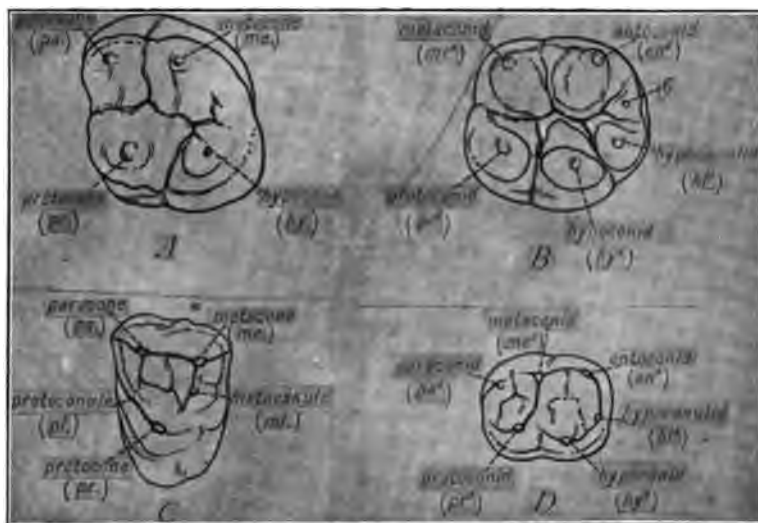


Fig. 3.—Cusp nomenclature as applied by Prof. Henry Fairfield Osborn to the teeth of *Man* and *Pelicodus Trigonodus*, an Eocene primate. A.—Occlusal surface of upper left molar of man. B.—Occlusal surface of lower left molar of man. C.—Occlusal surface of upper left molar of *Pelicodus Trigonodus*. D.—Occlusal surface of lower left molar of *Pelicodus Trigonodus*. (After Gregory.)

1. EVOLUTION OF THE MAMMALIAN MOLAR TEETH AND ITS BEARING ON OCCLUSION

The discovery by Professor Edward D. Cope, in 1879, of the oldest fauna of the age of mammals, or Tertiary period, near the Puerco Cañon in Northwestern New Mexico, revealed a general similarity in all the molar teeth, even among animals of diverse feeding habits. This similarity consisted in the possession of *three main cusps on the crowns of both upper and lower molars*, disposed in triangles. This was evidently a primitive type of molar tooth, and in

1883 Prof. Cope appropriately named it the *tritubercular type*.* By comparing these with the teeth of more recent animals, the further conclusion was reached that the "*tritubercular type was ancestral to many if not to all of the higher types of molar teeth*." The superabundant evidence from which these deductions were made then, and the study of additional collections bearing on this problem considered since, have established the primitive tritubercular type of molar not as a hypothesis or as a theory, but as a *fact*.

Based on authentic and reliable evidence from collections of paleontological material studied by Prof. Osborn, Dr. Matthew, Dr. Gregory and Mr. Gregory of the American Museum of Natural History, it has been made quite plain that the trigonal upper molars and the tuberculo-sectorial lower molars are the ancestral pattern and may be traced along divergent lines into the more

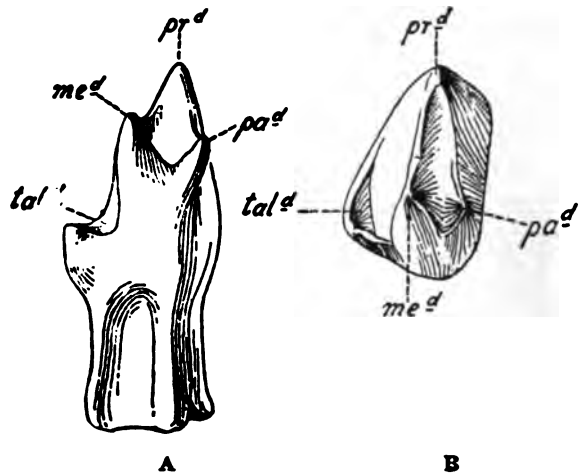


Fig. 4.—Diagram of a primitive tritubercular lower left molar (*Phascolestes*). A.—Lingual aspect. B.—Occlusal view. (After Gregory.)

plex molars of various groups of insectivores, carnivores, condylarths, sordactyls, primates and other orders. Thus, it is a fact worthy of consideration that in the Paleocene and Eocene epochs most of the known families of placental mammals exhibited varieties of molar patterns which are very peculiar and demonstrably modifications of the primitive tritubercular type.

Fig. 4, A, B, represents an enlarged diagrammatic representation of a tremendously primitive tritubercular lower left molar from its lingual and occlusal aspects. It belongs to an animal (*Phascolestes*) of the upper Jurassic period, *Trituberculata*, a probable ancestor to all placental mammals. As will be noted, the apex of the occlusal triangle as represented by the main cusp, the *protocone*, is directed buccally; the other cusps forming the base are placed lingually. Naturally there is a *cingulum*, *heel* or *talonid*. In the upper molar, the cusp triangle is reversed; i. e., its apex presents lingually and its base buccally. The occlusal

*In 1895, Prof. Osborn applied to the cusps of the human molars the system of nomenclature he had invented at an earlier period for the molar patterns of Eocene mammals. It is to be regretted that this terminology was not adopted by the dental profession as it replaces such cumbersome terms as "lingual cusp of the upper molar" by the simple term, *protocone*, etc. (see Fig. 3). Moreover, "we understand," Prof. Osborn contends, "that all the teeth of all placental mammals have this key tritubercular key, we can unlock the comparisons through the series and point out the homologies."

of this type of molar is of an interlocking or alternating character, and prevailed in the Mesozoic mammals. A living example representing this type of molar and occlusion is found in the Australian Marsupial Mole *Notoryctes*, Fig. 5, *A, B*. In this form of occlusion, the lower teeth are wedged into the triangular spaces between the upper teeth. The upper molar crowns constitute at this stage



Fig. 5.—Dentition of Australian marsupial mole, *Notoryctes*. Occlusal view of upper and half of lower jaw, showing tritubercular type of molar in both. (Am. Mus. of Nat. History.)



Fig. 6.—*A* and *B*.

Fig. 6.—Lateral aspect of lower jaw of (A) an Eocene carnivore (*Sinopa*) and (B) a modern omnivore (Opossum) showing the difference in the occlusal plane of the trigonid and the talonid in the molars. (Am. Mus. of Nat. History.)

chiefly a wedge, while the lower teeth besides contributing the wedge part present a posterior spur, or talonid, as seen in Fig. 4, B (tal d). This talonid is the starting point of the overlapping relation. We have thus, according to Gregory, in the evolution of occlusion, "first, *interlock*, and then, *interlock overlap*."

To elucidate, it must be explained that the part of the molar presenting three cusps, called the trigon in the upper and trigonid in the lower, constitutes the wedge portion of the tooth. The posterior part, subsequently developed from the palatal cingulum on the upper molar, is called *talon*, while that portion developing from the spur on the lower molar is called *talonid*. The *talon* and *talonid* represent the lapping portions of the teeth in occlusion. In the



Fig. 7.—Dentition of Sinopa and Opossum. A.—Occlusal view of upper dental arch, showing tritubercular upper molar. B.—Occlusal view of left half of lower dental arch, showing tuberculo-sectorial lower molar. C.—Lingual view of premolars and molars in occlusion, showing protocone in the fossa, and trigonid fitting into the triangular spaces between the tritubercular upper molars. A', B' the dentition of Opossum illustrating the same points as A, B, C, more clearly. (Am. Mus. of Nat. Hist.)

molar the trigonid, as may be seen in Fig. 6, is always on a higher plane than the talonid. The wedge-type molar relationship was reached in the age of reptiles (Secondary of Mesozoic era) while the lapping stage developed with the beginning of the age of mammals (Tertiary period or Cenozoic era). "In the primitive mammals of the Eocene epoch, we find the normal tritubercular type of the upper, the lingual cusp of which is overlapped by the developed talonid. The anterior portions of the lower molars still fit into the spaces between the upper molars, but the posterior extension or talonid now overlaps broadly, so we have the stage of overlap well defined." (Gregory.) This type of lower molar, possessing the wedging portion (trigonid) and the lapping portion (talonid), was named by Prof. Cope *tuberculosectorial*. The sectorial part being the wedge-like trigonid and the tubercular part the talonid. "The tuberculosectorial type is the ground plan of which we still find traces in modern insectivorous, carnivorous, herbivorous

ous mammals and in primates. Figs. 7*A*, *B*, *C*, *A'*, *B'*, *C'* illustrate the dentitions and their occlusion of an Eocene carnivorous (*Sinopa*) and a modern omnivorous (*Opossum*) mammal in close resemblance of the teeth and occlusion.

2. THE FORM, NUMBER, POSITION AND OCCLUSION OF THE TEETH IN MODERN PLACENTAL MAMMALS

The Molars.—It is plainly visible (Fig. 7, *C*, *C'*) how the mesial wedging portion (trigonid) of the lower molar fits into the space between the upper molars and how the distal lapping portion (talonid) overlaps the occlusal crown



-Fig. 7—*C*.



Fig. 7—*C'*

portion of the upper molars accommodating the lingual cusp (protocone) into its basin-like depression. The upper molars at this stage are still of the tritubercular type, the spaces between them being of considerable functional importance. For, possessing, as the tritubercular molars do, *cutting edges*, the marginal ridges connecting the trigonal cusps, and *piercing or crushing points*—the cusps, the wedge-type of occlusion enables them to constitute an efficient apparatus for flesh eating purposes. By modification of the cutting edges of the trigon and

trigonid in subsequent adaptation, the modern carnivorous specialization occurred. Thus the elongation of the *metacone-metastyle* portion in the upper premolar and the modification of the *protoconid-metacoid* region in the lower molars produced the carnassial adaption (Fig. 8, *A, B*). On the other hand, the increase in size of the cusps, the broadening transversely of the upper crown and the development of the hypocone to the extent of obliterating the interdental space, produces the crushing tooth as may be seen in the Insectivore (Fig. 9, *A, B*). (*Gymnura*). In the crushing type, therefore, the points or cusps become predominant and the overlap of one part on another becomes accentuated so that it is now the occlusal surfaces of the crowns that oppose each other rather than the sides. This change consequently involves the modification of the wedge-shape triangular pattern into a quadrangular type of molar. Thus



Fig. 8.—Dentition of Leopard. A.—Occlusal view of upper jaw, showing modification in the premolars from the rudimentary (second) to the specialized carnassial (fourth), and the diminutive first molar. B.—Occlusal view of lower jaw, showing modification in form of the lower premolar, the first molar, the carnassial tooth. (Am. Mus. of Nat. History.)

in the quadrangular type the upper molar still possesses the primitive triangular pattern, but has in addition developed the disto-lingual cusp, the *hypocone*. The occlusion of this type of molar, then, presents these main features: the *hypocone* of the upper molar is accommodated, as before, into the talonid basin (mesial fossa) of the lower molar, while the *hypocone* fits into that of the tritubercular (mesial fossa). This form of occlusion best serves the purpose for the crushing and grinding type of molar. These, then, are the gross modifications in the form of the molars in their evolution from the primitive tritubercular type to the sectorial, quadritubercular and tuberculo-sectorial pattern of modern placental mammals.

The change in position, though not as accentuated as that occurring in the insectivore during the course of evolution, may, nevertheless, be classified in accordance

with the direction assumed by the mesio-distal axis, and manifested by the buccal surfaces. Thus, in the primitive triangular form of molar, the buccal surfaces of the upper teeth are arranged in an evenly aligned series, there being no buccal lapping or prominence. The position of the lower triangular teeth can not be described as they are separated from one another and do not form a continuous series. In the modern carnivorous modification, especially in the lower premolar-molar series of the Felidae, it may be noticed that the distal end of one molar laps the mesial portion of the tooth behind as is evident in Fig. 8. (Leopard.) And last, in the quadritubercular, square type of tooth, the condition is reversed; namely, while there is no actual lapping, the mesio-buccal angle of the molar or of the molariform premolar projects buccally beyond the disto-buccal angle of the tooth in front of it. (Fig. 9A.) These, though primitive features regarding position, persist as we pass through the various orders of mammals.



Fig. 9.—Dentition of *Gymnura*, Insectivore. A.—Occlusal view of upper jaw showing development of quadrangular, quadritubercular upper molar for crushing purposes. The interdental spaces are obliterated and the mesio-buccal cusp is more prominent buccally than the disto-buccal of the molar anterior to it. B.—Occlusal view of lower jaw, showing full complement of cusps on trigonid and talonid, difference in form and arrangement of incisors as compared with those in the upper jaw. The premolars in both jaws varying from caniniform first to molariform fourth. (Am. Mus. of Nat. History.)

Another change in position may be noticed in the longitudinal axis of the molar teeth; thus, whereas the occlusal surfaces of the primitive tritubercular molars and those of the lower modern placental mammals are directed inward in the upper jaw and outward in the lower jaw, this direction is reversed in the anthropoids and man, the crowns of the lower molars being tilted inward (lingually) and those of the upper outward (buccally).

The Incisors.—The incisors of the insectivore, (*Gymnura*), Fig. 9, A, B, present different forms in the upper and lower jaws. In the upper they are round, pointed pegs, while in the lower they resemble very much the worn lower deciduous human canine, but considerably smaller, increasing in size mesio-distally. The position of the incisors in the upper arch is almost parallel on the two sides, they are widely spaced, and their long axis vertical; in the lower jaw they are placed in a sharp curve and are considerably procumbent in their long axis. There are intervals or spaces between the centrals, larger in the upper than in the lower.

In the Opossum which in dentition is a little changed survivor of the primitive marsupial of the age of reptiles, the upper incisors are very diminished in size and in form they resemble those of the lower in the Insora. They are all of the same size, the centrals separated and pointing to each other mesio-incisally. Their horizontal position is more like an angle, the angle being in the central incisor region and the sides formed by four incisors on either side. They are also axially vertical to the occlusal plane. The lower incisors are long and slender, resembling more the teeth of a carnivore though more round, and the tip is capped by an enamel covering. They are procumbent, arranged in almost two straight lines, meeting at an angle in the symphyseal region.

The incisors of modern Carnivora, in the Felidae (Fig. 8) for instance, resemble considerably the form of the human lower deciduous canines. The centrals are extremely small and the others increasing in size mesio-distally so



Fig. 10.—Dentition of Badger (*Taxidea Americana*). Front view, showing caniniform incisors and position of lower second incisor. (Am. Mus. of Nat. History.)

the third has always been described as *caniniform* in appearance. They are arranged in a straight line transversely, probably best to subserve their purpose of tearing the flesh from their prey. In the Mustelidae (Fig. 10) the incisors are decidedly caniniform, the second situated more lingually than the others. They are of the same size and interlock in occlusion.

In the Herbivora they reach two extremes in form as they do in number and position. Thus, in the Artiodactyla (the even-toed ungulates) they acquire a broad and flat shovel-like shape in the lower jaw while in the upper they are missing, as in the Pecora (sheep, cow, etc.). In the Perissodactyla (odd-toed ungulates) they are also broad but more stout, of considerable difference in anatomy, and are present in the upper jaw as well. In both orders, they are arranged in a broad but even curve, the lower incisors assuming a procumbent position, while the uppers are more vertically placed. In the Camel, the lower incisors are very flat with a sharp cutting edge lapping one another considerably.

The *Rodentia* again exhibit a complete modification in the incisor region. The number being reduced to $\frac{1}{1}$ except in the *Duplicidentata*. The incisors are long, curved, and possess a chisel-like edge. Enamel covers them only labially and proximally, and they possess a persistently growing root. In the *Duplicidentata* (rabbits, hares and picas) there is also a lateral incisor present. Its form is that of a fine peg, and its position is lingually to the central Fig. 11 (Rabbit). In all placental mammals, the occlusion of the incisors appears either in an edge-to-edge bite as in the *Insectivores*, *Carnivores* and *Perissodactyls*; or in an overbite as in the *Rodents* when the molars are in occlusion. In the *Lemurs*, the incisors are not in occlusion, but rather present an open bite.



Fig. 11.—Dentition of *Rodent*. Occlusal view of upper jaw of Rabbit, showing position of lateral incisor lingually to the central. (Am. Mus. of Nat. History.)

The Canines.—The Canines vary considerably in their morphologic aspect, so as to range from their entire absence, as in the *Rodentia*, through the vestigial appearance in certain ungulates to the enormously sabre-like structure in the sabre-toothed tiger or, in the wild boar. In some mammals, they become incisor-form; as in the *Pecora* (certain Deer, Antelopes, Sheep, Cow, etc.) in others they assume the incisor position and function as in some of the *Lemurs*, Aye-Aye, (*Daubentonia madagascariensis*).

The Premolars.—The premolars also vary extremely in form, as may be seen in *carnivora* Fig. 9*A* the p 2 having the vestigial appearance of a truncated

cone, without any functional importance, while the $p\ 4$ is transformed into a carnassial tooth, which is of greatest functional significance. Again in the ungulates, especially in the Perissodactyla, they so completely resemble the canines in form and proportion as to be indistinguishable from them, excepting molar 1 the *wolf-tooth*, in the horse which is a deciduous tooth, and is caniniform. Their position is as erratic as their form but in the main they follow the position of the molars, with modification in accordance with the form of the alveolar arch.

To sum up what has thus far been discussed, the following points may be emphasized:

1. That the dentitions of all placental mammals have sometime in the course of their evolution passed through the *tritubercular molar* stage.
2. That while all placental mammals have started out with the same molar pattern, they have evolved such divergent types as to produce the extreme differences in the carnivores, ungulates, and insectivores.
3. That with the modification in form of the molars into the crushing and grinding types, the mesio-distal axis is also changed in dimension and position.
4. That despite the great diversity in form of the molar pattern of modern placental mammals, the occlusion remains fundamentally the same.
5. That the antemolar teeth also assume positions in accordance with the form and functional adaptation, the incisors especially presenting the edge-to-edge or the overbite occlusion.
6. That although the various placental mammals have started out with the same dental formula $\frac{3, 1, 4, 3,}{3, 1, 4, 3,}$ they have reached a stage of such divergence as to present at one extreme no teeth at all (the Great American Ant Eater) and at the other the full mammalian complement of teeth (the Horse).

And, finally, that manifestations which might have been considered anomalies have gradually become normalities. Chief among the normal anomalies are:

- a. Lapping of lower incisors in *Camels*.
- b. Lingual position of second lower incisors in Mustelidae (*Badger*, *Skunk*, *Sea Otter*, etc.)
- c. Position of upper lateral incisors behind the centrals in Duplicidae (*Rabbits*).
- d. Assumption of incisor form by lower canine in Pecora (Cow, Sheep, etc.).
- e. Assumption of incisor position and function by the lower canine in Lemurs (*Aye-Aye*, *Daubentonia madagascariensis*).
- f. Development of second upper incisor to enormous proportions in Proboscidea (*Elephants*).

(To be continued.)

LINGUAL LOCK

BY DR. J. B. KOHAGEN, DULUTH, MINN.

AFTER using a lingual arch on a number of cases, it occurred to me that with present locking devices it was rather difficult to avoid considerable play or movement in the anterior part of the arch. This movement seemed to increase after a number of removals of the arch which no doubt was due to a slight wearing of surfaces of the lock.

I also found that as soon as my patients were aware of any arch movement it encouraged them to manipulate it with their tongues until they appeared at the office with arches very much distorted.

It seems to be difficult to construct a single tube lock that will hold an arch rigidly. It has also been my experience that there is a variation in the size of the half-round tubing and wire which we purchase from the manufacturers that makes it difficult to keep the arch rigid.

The device which I am about to describe is practically a doubling up of the half-round wire and tube lock as used by Dr. Mershon.

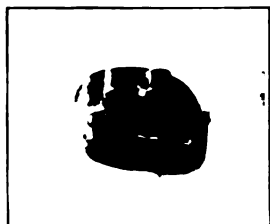


Fig. 1.



Fig. 2.



Fig. 3.

Fig. 1 shows half-round tubes soldered to molar anchor band.

Fig. 2 shows half-round wire soldered to 19 gauge arch and T lock wire. For the shank of the T wire I use 21 gauge gold wire, this stands repeated bending without breaking. The cross piece of wire which locks under the tubes is 21 gauge Ney Oro wire.

Fig. 3 shows the arch in position with lock bar under the tubes. It might occur to you that there would be some difficulty in keeping the tubes and half-round wires aligned, but in answer to that thought, will say that I use no device whatsoever, just a case of free-hand soldering. This lock you will find will hold the arch wire very rigid on account of the greater bearing surface of the arch on the tubes and is still compact and comfortable in the mouth.

With a single tube any movement whatsoever in the lock will cause considerable movement in the anterior part of the arch but with the double tubing and the lock bar drawn into place the arch is brought to bear on both tubes, affording a greater bearing surface, thereby preventing any movement.

DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTICS

Under Editorial Supervision of

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REMOTE MANIFESTATIONS OF FOCAL DENTAL INFECTIONS, WITH CASE REPORTS*

BY RICARDO FERNANDEZ

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Chief of the Department of Physical Therapy, Philippine
General Hospital*

IT IS a common practice in the treatment of certain articular and muscular affections of various types to make clinical and laboratory examinations from a view to determine the presence of so-called chronic rheumatism, acute rheumatism, fever, or uricacidæma or gout; hence the custom of requesting urine examination to enable the practitioner to determine the total amount of uric acid, and to estimate the quantity contained in the blood. An elaborate medical and dietetic treatment is then given, coupled sometimes with physical therapy, but in the majority of instances such treatment is a failure.

There is no pretention of originality in my paper; the motive that induced me to prepare it was to suggest to my confrères that in such affections they should depart from the line of investigation heretofore followed.

Sinclair Tousey, in the preface of his monograph on "Roentgenographic diagnosis of dental infection in systemic diseases," mentions the observation of the wife of an eminent jurist, who died as a result of an infection localized in the socket of a tooth; this focal infection was diagnosed rather late by means of the x-ray. He says:

"The widest publicity should be given to the fact that greatly varying degrees of sometimes serious or fatal systemic diseases and those affecting remote organs are often due to infection connected with the teeth or with the pneumatic sin-

*Read before the Manila Medical Society December 3, 1917. Published by permission of the Bureau of Science of the Government of the Philippine Islands.

of the face. The infected foci are discoverable by the x-rays. Some of these cases are cured by treatment of the oral lesion and some require also autogenous vaccination with a bacterial culture from the pus in the oral lesion."

Hardly any importance has been given to alveolar abscesses as possible causes of serious and remote disorders in the body; although it has always been considered important to detect the presence of pus in any region of the body, so as to account for, sometimes, the whole group of symptoms in certain isolated clinical cases. The reason why due consideration has not been given dental infections is that we have been treating morbid conditions; symptoms and their clinical course we never thought might have an intimate relation with dental lesions.

The researches of E. C. Rosenow and of Frank Billings, confirmed later by Hartzell and by others, as to the relation of various pathological manifestations to chronic dental infections, have been the guide of radiologists, dentists, physicians, and laboratory workers. In consequence the medical literature has been enriched by enough data to enable us to form a clear and exact idea concerning the intimate relation existing between chronic dental infection and certain forms of arthritis, neuritis, neuralgia, various types of rheumatic manifestations, and certain pathological conditions in the stomach, the duodenum, the appendix, the gall bladder, the heart, and the kidney, and blood diseases such as pernicious anæmia, etc.

Taking into consideration the fact that the manifestation of chronic dental infection cannot generally be diagnosed with accuracy by any clinical means without the x-rays—and even with them in certain cases with difficulty—I will first deal with the two main dental infections that commonly bear relation to the morbid manifestations mentioned; namely, the apical and periapical abscess and pyorrhea alveolaris. As a routine in our dental radiograms we employ the extraoral method with photographic plates and, exceptionally, the intraoral by means of photographic films and plates of proper dimensions to be placed within the mouth. We deem the extraoral method more practical, inasmuch as it enables us to obtain, not only a large number of teeth, but certain information concerning both maxillæ, especially the upper, in its relation with the nasal cavities and the maxillar sinuses.

With a well-conducted technic, we are able to make a complete exploration of both maxillæ, and their respective teeth, by five exposures, whereas twelve at least are necessary in the intraoral method—six exposures for the inferior—provided that every one of the exposures is satisfactory.

In order to save time on one hand, and to avoid the patient being unduly exposed to the x-ray on the other, we decided to use the extraoral in preference to the intraoral.

We use the oblique projection technic recommended by Drs. E. Speder, J. Belet, and J. D. McCoy.

With this technic we succeeded in exploring all the teeth and the maxillæ, and thus could detect any change from the normal appearance of each particular tooth.

In the interpretation of the x-ray plates, for the detection of apical abscess, one must bear in mind the relation of the natural cavities as, for instance, the

antrum of Highmore with the superior molars; the nasal cavity with the superior incisors; and the foramen of the inferior maxilla with the inferior premolars. Otherwise, any one of these natural cavities might be wrongly taken as a shadow produced by an abscess, and thus we might give an erroneous diagnosis, with serious consequences. With the foregoing precaution, it is relatively easy to diagnose with accuracy any abscess that might develop in the dental apex around it, even though there are no clinical symptoms, if the negative shadow shows a dark area circumscribed in the dental apex or in the alveolar cavity, and if the dark area is well defined and sharply separated from the neighboring areas by a line of demarkation.

This dark area, a very characteristic radiogram of an abscess, is produced by diminution of density, or decalcification and sometimes destruction of dental tissue. If the dark area is very pronounced, almost black, we can infer the probable presence of pus in the alveolar cavity. It has been proved that pus may become fluorescent under the influence of the x-rays, and this fluorescence acts as an intensifier of the radiations acting upon the point or site where the abscess is located, and as a result we observe the very pronounced dark area in the negative.

Pyorrhea alveolaris, or Rigg's disease, is clinically demonstrable; it is nevertheless wise to remember that the presence of pus around the external border of the gums is not always due to Rigg's disease. A careful examination will sometimes disclose the cause as being the presence of calcareous deposit around the teeth, which may act as an irritant upon the gums and give rise to suppuration.

Clinical examination, aided by the x-ray, makes diagnosis certain in cases of dental infection, and at the same time the extent of the lesion may be determined in this way.

T. L. Gilmer and A. M. Moody are not in accord with Dr. C. J. Grievens of Baltimore, and Dr. W. S. Baer, of Johns Hopkins University, that *Staphylococcus albus* or *S. aureus* may be the causative agent of apical or periapical abscesses. Through experiment Gilmer and Moody have been able to identify the predominance of streptococci in aerobic and anaerobic cultures, aseptically obtained from pus in the foci, or the seat of acute, chronic, or latent infections of the maxillæ and teeth. *Streptococcus hemolyticus* was found in acute abscesses; *S. viridans*, in chronic; and *S. mucosus* was obtained only once.

Occasionally *Staphylococcus albus* and *S. aureus* have been isolated by some observers in aerobic cultures, and also *Micrococcus catarrhalis* and other unidentified saprophytic microorganisms. The streptococci in the anaerobic cultures are rarely obtained pure. Some cultures showed the presence in small numbers of *Bacillus fusiformis*, while in a few test tubes there were found small numbers of cultures of this bacillus. C. C. Bass and F. M. Johns give as a specific cause of alveolodental abscess the *Entamoeba buccalis* and possibly other species that invade and destroy the periodontal membrane.

While Hartzell and Henrici do not claim in their experiments that the streptococcus is an etiological factor in dental abscesses and in *Pyorrhea alveolaris*, nevertheless from the standpoint of metastatic abscesses they think it of paramount importance that such microorganisms are constantly present in the mouth with ulcerated surfaces; and they probably do invade deeper tissues and gain entrance into the circulatory channels.

Henry L. Ulrich says that out of one hundred seven cases of dental abscesses with bacteriological examination in the Minnesota Hospital, one hundred showed the presence of *Streptococcus viridans*; and out of fifty-two of his private cases, fifty also showed the presence of the same microorganism. They were also found with the above microorganisms, *Staphylococcus albus*, *S. aureus*, and *Micrococcus catarrhalis*.

Hartzell, Henrici, and Leonard, in their posterior researches, made the assertion that they found streptococci in periapical abscesses and in pyorrhea, and that these streptococci give rise in animals to inflammatory lesions in the cardiac muscle, vegetative growth in the valves, articular infection, inflammation of the blood vessels, and focal and diffuse infection of the kidneys. Similar lesions were observed in human beings upon autopsy, and these investigators believe that the lesions mentioned were caused by streptococci.

Recent bacteriological investigations carried out in the department of medicine of the University of Minnesota disclosed the constant occurrence of *Streptococcus viridans* in chronic dental abscess and pyorrhea; and, although *Entamoeba buccalis* was also found in oral infections, this is not recognized as the cause of pyorrhea, as Bass and Johns claim.

It is a scientifically proved fact that the gastric juice is not a barrier against the passage of bacteria and pus into the stomach and the intestines. Microorganisms in the mouth may be swallowed, as actually happens, and they reach the stomach without all of them being destroyed, and thus gain entrance into the intestines, causing under certain conditions throughout their course local affections such as gastric ulcer, appendicitis, etc.

Another route of dissemination from mouth infection is by way of either the lymphatic or the circulatory channels; hence the presence of focal infections of remote origin, as Hartzell, Henrici, and Leonard have shown in their clinical investigations already referred to.

There are localized infections of the tonsils, and others, that may coexist with pyorrhea and dental abscess; treatment for their eradication does not cure the disease if not properly attended to.

A thorough treatment of the teeth by the dentist, with extraction if necessary, was enough to eradicate all symptoms and other disturbances observed in patients. In instances where a conjoined local treatment by the dentist and the use of vaccines by the physician were available, improvement was rapid, especially when autovaccines were employed.

L. S. Medalla thinks that there is room for vaccine therapy in all cases of acute and subacute dental abscesses; and that, by the employment of this method, a good deal of suffering among patients and the loss of their teeth have been avoided.

In the use of autovaccine the necessary precautions must be taken to obtain the purulent material aseptically, without contamination. An autovaccine prepared under such conditions almost invariably brings about a surprising and rapid disappearance of the symptoms, which may not be observed if one is careless in the preparation of the vaccine.

Hartzell and Henrici believe that the elimination of the focal oral infection is very much more important than the use of vaccine, and they consider this as a mere adjuvant treatment in some cases.

The limited number of cases observed by me corroborate the facts which I have quoted here, in regard to the treatment.

Case 1.—W. T., adult, American, married, male, suffering for some time from lumbosacral and articular pain, the character and intensity of the former simulating nephritic colic. He looked very pale. Radiograms taken in the lumbosacral region showed the characteristic evidences of beginning *Arthritis deformans*. Radiogram of the teeth showed the evidence of pyorrhea in the only remaining molar in the lower mandible, right side, and abscess in the second upper bicuspid, left. Under appropriate treatment of the affected teeth, the hygienic care of the mouth, he improved markedly, and the painful symptoms disappeared. Recovery was slow, and there was left some rigidity in the knees on account of the definite lesions observed in the articulations.

Case 2.—F. L., adult, Filipino, male, married, complaining for many months of polyarticular rheumatism with acute exacerbations which prevented him from attending to his ordinary work. The medical and the dietetic treatments as well as the hydrotherapy given him afforded very little relief. Apparently his teeth were in excellent condition, but a radiogram showed the presence of an abscess in the remaining molar in the inferior maxilla, right side. Treatment of the dental abscess without any other medicine caused the gradual disappearance of his symptoms, and in four months he was completely cured.

Case 3.—C. de C., female, Filipino, married; she gave a history of some rheumatic pain; for two months she had been complaining of intense pain in the lumbosacral region, radiating to the left thigh. She was bedridden, and could neither sit nor walk. All previous treatment usually given in such cases was a failure, and the intense pain could be abated only by morphine injection. Radiograms of both kidneys and ureters were negative for stone; the vertebral column and the whole pelvis were entirely normal. Radiogram of both maxillæ showed the presence of abscesses in both first molars in the superior mandible. Both molars were extracted under anæsthesia, and cultures of *Micrococcus viridans* and *Staphylococcus albus* were obtained. Autovaccine was prepared and all other treatment previously given was suspended. The first injection given was 33,000,000; on the third day she was given another of 50,000,000. On the day following the first injection there were observed dizziness, nausea, and pain in the teeth, worse on mastication and on drinking cold water. On the sixth day after the first injection she was given another of 50,000,000, and thereafter 100,000,000. at two-day intervals. After the third injection there was abatement of the symptoms observed after the second one and, to her surprise, she was able to sleep and to move her lower extremities freely. After the sixth injection the patient was able to sit up in bed without any trouble; after the eighth, she could walk alone. Her general condition improved, and she was finally cured very rapidly.

Case 4.—M. de F., adult, female, Filipino; with previous history of some rheumatic affection, and complaining of intense pain in the left shoulder. The radiogram of the shoulder showed evidence of *Arthritis deformans*. She received medical, dietetic, and electric treatment with no improvement. I suggested that an x-ray picture be taken of her teeth, and the radiogram showed an abscess in the first bicuspid, right inferior maxilla, and abscesses also in both bicuspids.

superior maxilla, with pyorrhea in the lower incisors. Culture taken from the pyorrhea was positive for *Micrococcus viridans*. Autovaccine was prepared, and injections of it ameliorated her symptoms, and complete improvement is expected when her teeth will be entirely cured as she is at present under the care of a good dentist.

Case 5.—P. J. C., adult, European; suffering from articular manifestations for twenty years. He was always under dietetic and medicinal treatment, without showing real improvement. Radiogram of both maxillæ positive for pyorrhea in the last molar, left lower maxilla, and abscess in the last two molars, left inferior maxilla, with pyorrhea in the second false molar and the first molar, superior maxilla, left side. The two inferior molars were extracted and the culture taken was positive for *Micrococcus viridans*. Vaccine was prepared and after the second injection the patient was able to wear his shoes, and he experienced no trouble on walking.

Case 6.—V. de C., adult, Filipino, female; with previous history of rheumatism following an attack of paratyphoid fever. Ever since she has been having fever with temperature between 38° and 39° and occasionally as high as 40°. All the intestinal symptoms of paratyphoid have disappeared, but there is persistence of some articular pain. There is no indication of any tuberculous lesion. Radiogram of the teeth shows evidence of pyorrhea in the false molar and the molar supporting a bridge in the inferior mandible, right side; pyorrhea in all the false molars left side, upper mandible, and also in the two false molars and the first molar, right side, upper mandible. Extraction of the false molars and the true molars, which were quite movable in their sockets, was followed by the disappearance of fever, though later the fever recurred, but in a very slight degree. Culture was positive for *Micrococcus viridans*. Autovaccine was prepared and injections were given, with gradual and complete disappearance of fever.

Case 7.—M. V., adult, Filipino; suffering trifacial neuralgia, right side, for some time. All medical and electric treatment given in Europe was of no avail. There was improvement but never a cure. Radiograms taken show evidences of pyorrhea in the false molar and canine, right side, inferior maxilla. These teeth were extracted, and culture taken was positive for *Micrococcus viridans*. As a result of injection of the autovaccine the intervals between attacks of the neuralgia are longer and the pains less intense. Patient is at present under treatment and observation.

Case 8.—M., adult, Filipino, male, married; with previous history of rheumatic pain and venereal disease, very suspiciously like syphilis. He has been suffering for a long time from periodical attacks of trifacial neuralgia, severe in character. He received the usual treatment for trifacial neuralgia, and mercury injections for suspected syphilis. Treatment was a failure. On examination, his teeth were found to be in very poor condition. Radiogram shows evidences of pyorrhea in the upper bicuspid, right side, and an abscess of the first molar, lower right. Once the pyorrhea and the abscess were treated, he made a complete recovery.

Case 9.—V., adult, Filipino, married; with previous history of rheumatic pains with acute exacerbations, only relieved by salicylate treatment, but the

symptoms never disappeared entirely. Radiogram showed the presence of an abscess in the false molar, and pyorrhea in some of the teeth. Local treatment of the pyorrhea and the abscess, and autogenous vaccine, resulted in a complete cure.

Case 10.—J. L., adult, Filipino, married; complaining of acute inflammation of the joint of the right shoulder. Mouth in a very bad condition, with evidences of pyorrhea. Former treatment for arthritis of no avail. He could not use or move his right arm on account of pains. Polyvalent vaccine was prepared, and after three successive injections of 100,000,000 each, there was observed marked diminution of the inflammation. Ten days after treatment the patient was able to use his right arm.

The cases above reported, and those under my observation and treatment, are certainly very few from which to draw conclusions; but examination of the history of the cases reported will show that the results obtained from the therapeutics followed by me fully accord with the outline of treatment discussed. Therefore, as the symptoms disappeared with the disappearance of the focus of infection, the symptomatic manifestations observed were related to the dental infections discovered.

In cases where cultures were made, *Streptococcus viridans* associated with *Staphylococcus* was obtained in one case (3); and in the others, only *Streptococcus viridans* was found. Vaccine of 100,000,000 per cubic centimeter was prepared from the microorganisms obtained from each patient.

Patients treated by the cure of affected teeth or by simple extraction showed gradual recovery, while those who received local treatment, associated with vaccine therapy, recovered more rapidly.

In Cases 9 and 10, the use of vaccine therapy, with polyvalent vaccine, gave positive results when associated with local treatment of the infection.

I wish to express my appreciation to Prof. A. G. Sison for his courtesy in making the English translation of this work and for furnishing bibliographical references; to Prof. Jose S. Hilario for the preparation of vaccines; and to Dr. A. de Asis for his valuable coöperation as a dentist.

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DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Under the Editorial Supervision of

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It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

SOME RADIOGRAPHIC ANOMALIES

BY JOSEPH POLLIA, M.D.,

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THE anomalies as illustrated and described may prove interesting. It is to be regretted these particular abnormalities do not show up more clearly. Case 1 came into my office with an acute conjunctivitis of the left eye. A prominent eye man ordered x-rays of the teeth and the third molar was extracted. After three days no appreciable change was seen in the condition of the eye. On reviewing the x-rays, which were brought in, I ordered the cleaning up of the edentulous area adjacent to this molar.



Fig. 1.—Infraorbital foramen.

You will note that there is an area over the buccal root of the molar which was extracted. This was diagnosed as an abscess. After cleaning out the designated area, the condition immediately improved. The question now, from the point of radiographic interpretation, is, "Should the third molar have been extracted because of the area at the apex of the buccal root?"

Close scrutiny will show that the peridental membrane shows no increase in size at this point. The peridental lamella or linea dura is intact and in close relationship throughout. Therefore, said area can not be pathologic. We note that the molar shadow is thrown over the apices of this molar and the only anatomic orifice radiographically possible with this relationship, is the infra-orbital foramen.

Radiographic diagnosis: Infraorbital foramen; of course it is surmised in this particular case that the rarity of this anatomic shadow of radiograms in the molar regions, was responsible for the extraction of the tooth.

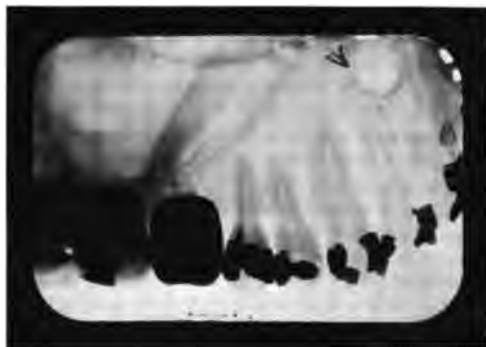


Fig. 2.—Anterior palatine foramen.

Case 2.—There is an area of radiolucence over the right central rather dimly shown. This central was, however, not extracted, due to the timely advice of one of the Board of Directors who was called in hasty consultation. It was his opinion that this was the anterior palatine foramen. On being presented to me, I agreed that such was the case.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

The Road of Vision in Orthodontia. Hoggan. Journal of the National Dental Association, May, 1920, vii, No. 5.

Orthodontia as shown by Angle rests upon normal occlusion. The latter, however, is a means to an end not the end in itself. Efficiency in natural occlusion is low in comparison with that of assisted occlusion. The real goal is good function. Some have restricted the services of orthodontia to the eruptive period but this so-called legitimate field is an ideal. Orthodontia is more than harmony between the teeth, it is harmony between the jaws and the face as a whole. But a disharmonious face is not necessarily dependent on malocclusion. When a mother asks that her child grow up with a Harrison Fisher or Dana Gibson chin she may be asking for a disharmonious face. It is not impossible to produce such a result but in many faces it would be quite out of place. The hidden influence of a dental training in early life is according to the author shown in the fact that one of the greatest of our anthropologists and one of our leading artists both began life as dentists. The author gives a description of his method of measuring teeth in connection with the practice of orthodontia.

Prophylaxis and Radiology in the Practice of Orthodontia. Casto. Journal of the National Dental Association, May, 1920, vii, No. 5.

The author by prophylaxis refers to the preparation of the mouth before any orthodontic apparatus is worn. The buccal cavity is put into the best possible condition by the usual resources. The orthodontist proper does not, of course, do this work himself; it is either turned over to an assistant or the patient is referred to his regular dentist or asked to consult one who does periodontia. In regard to orthodontic apparatus bands should be so applied that the periodontal tissues will not be injured. The patient consults the orthodontist every two weeks while under treatment, while prophylactic treatments are carried out every six weeks and orthodontic apparatus removed at the end of six or eight months. In regard to radiology the author is aware that orthodontists do not as a class realize what they can do to promote their art. He has convinced himself of this usefulness after a period of indifference to radiology. He has the x-rays made in his own office by a technician, not necessarily a dentist. The films may

be developed while the patient waits. The plates show many interesting and unsuspected conditions. We get an idea of the missing and unerupted teeth. By missing teeth are meant any which are congenitally absent. Pulpless teeth are also checked up.

Interpretation of Angle's Classification of Malocclusion, Etc. Hellman.
Dental Cosmos, April, 1920, lxii, No. 4.

Examination of 800 cases of malocclusion has shown that in a very high percentage of cases the upper molars are rotated. This rotation seems to occur in such a manner as to bring the buccal cusps into an even buccal plane with the rest of the teeth. It seems to affect the position of the mesio-lingual cusp in such a manner as to influence its occlusion mesio-distally in a very slight degree, while the buccal cusp may at the same time appear in a decided malposition. It shows therefore that the pivotal point of rotation of the upper molar is in the region of the longitudinal axis of the lingual cusp. Secondly it demonstrates that the effect of such deviation is to allow the mesio-buccal cusp to assume a more mesial position than that of the lingual cusp, thereby leaving the mesio-lingual cusp either entirely in its primitive relation, or to move considerably less mesially than the buccal cusp. Therefore in most distal occlusion the mesio-lingual cusp of the upper molar will be more nearly in its primitive relation while its relation to the central fossa of the lower molar in occlusion is the last vestige of the primitive occlusion to be severed in the transition toward malocclusion. Hence to secure a correct classification of occlusal anomalies we should eliminate from consideration the buccal aspect of cusp relationship and substitute the lingual cusps of the upper molars and the occlusal fossæ of the lower molars, these, constituting the most primitive landmarks of occlusion still persisting in human dentition.

Mutilating Extractions of Milk and Permanent Teeth. Oppenheim. Wiener Vierteljahresschrift für Zahnheilkunde, October, 1919, xxxv, No. 4.

The author first mentions Angel's theory of occlusion which has more or less modified our former attitude on extraction of teeth. Black has also shown by the dynamometer that artificial teeth exert but feeble pressure in mastication. Everything points at present to the necessity of retaining the natural teeth. Extraction may be followed by a series of deformities. One of the most familiar is the elongation of a tooth after its opposite has been removed. In the case of the milk teeth mass extraction is quickly followed by elongation of both the antagonistic teeth and the alveolar process, although it is denied that such elongation is seen in the lower jaw. But this form is only one of many, so that in the compass of a short article only a few of the most crass examples can be quoted. Extraction of labially erupted canines very often is followed by deformity which might have been averted by proper cosmetic treatment. Extraction of these teeth causes falling in of the upper facies and may even give rise to an appearance of toothlessness. The subject looks apathetic and prematurely old. These marked changes result from so small a cause as atrophy of the canine alveoli and the pressure of mastication is transferred from its normal bearings with disastrous results. In the case of unilateral extraction of these canines

the face shows marked asymmetry. The author mentions compensatory extractions which help to offset in a measure an unwise or necessary first extraction but some authorities appear to condemn these symmetrical extractions as without a preponderance of advantage. Modern orthodontia is antagonistic to all extraction and is constantly limiting the field of the latter although this must often be a matter of prophylactic activities.

Changes in the Dental Arch During Childhood. Sir Frank Colyer. Dental Record, May 1, 1920, xl, No. 5.

The author cites passages from the writings of Hunter and Tomes which are not in accord with his own observations. He cites the cases of three children which he has followed from the age of three years. All were breast fed and free from nasal obstruction and there was no history of any treatment for adenoids or enlarged tonsils. Measurements were made between the canines and deciduous second molars with a special apparatus which is more refined than the use of plaster casts. These measurements were repeated at intervals until the ages of 11 or 12 and curves were plotted. Both jaws were subjected to this study. The diagrams on millimeter paper show a rapid increase in intercanine width between the age period 6 to 8 which corresponds to the eruption of the permanent incisors. There is also a more regular increase in width between the deciduous second molars. The maxima in each case was about the same—3mm. for the canine interspace and 3.1 mm. for the space between the molars. In the case of a fourth child in whom the teeth were somewhat crowded the causation of the latter was not learned. In all four children the width of the arch increased between the ages of 4 and 11 and in the abnormal arch the crowded condition of the deciduous teeth suggests that there was interference with growth during the first four years of life. The author believes that the development of the permanent teeth enlarges the arch but the mechanism is not clear. This may be a widening of the premaxilla which is seen sometime before the sixth year. In any case well marked sutures in the maxilla usually correspond to a well developed arch, while indistinct sutures are associated with crowded teeth. Early closure of sutures appears to mean underdeveloped arches.

Surgical Removal vs. Extraction of Infected Teeth. Robert Burns. The Dental Cosmos, 1920, lxii, No. 3.

Dead, devitalized, abscessed, and pyorrheic teeth should never, according to the author, be merely pulled, this truth having become apparent through the labors of Rosenau, Billings, Hartzell and others. By the same token it is unwise to treat the root canals in the expectation of disinfecting them. Dead dentin is analogous to dead bone, but unlike the latter does not spontaneously detach itself by sequestrum formation. Removal, however, does not become imperative until the cementum loses its pericemental attachment. In theory it may be possible up to this juncture to disinfect dead roots but we know little as to the actual percentage of cases in which all pulp tissue is removed and the dentin tubuli and root apex completely sealed. The success of these procedures is bound up in the behavior of the filling material, for a certain amount of con-

traction of the latter seems inevitable in the course of time. The author believes that in trying to disinfect dead roots we are working against the chances. These teeth must always be regarded with suspicion and hence carefully studied for the appearance of active symptoms. Neither the absence of discomfort nor negative radiograms nor good condition of the gum can absolutely decide the condition of the roots as long as the subject presents symptoms usually summed up under "rheumatism," "neurasthenia," etc. In infected roots the bone usually participates and it is precisely this fact that renders mere extraction insufficient. In theory curetting the socket might answer to complete the extraction, but in practice this is not only highly inefficient but actually dangerous; since it tends to carry the infection into the antrum, inferior dental canal, etc. The operation to perform consists in cutting through the alveolus with a chisel and having removed the bone to lift out the root, everything being under the eye control. Even loose teeth should never be merely pulled in pyorrhea cases. The exact amount of diseased bone can then be determined and removed.

A Stovaine-Antipyrin Analgesic Association. Losada Argibay. La Odontologia, November-December, 1919, xxvi, Nos. 11-12.

The author who is physician-dentist to the military garrison at Granada, Spain, recommends highly the following solution for local anesthesia in oral surgery; stovaine, 1 gm.; antipyrin, 2 gm.; solution of adrenaline 1-1000, 100 drops; distilled water 100 gm. Antipyrin powerfully reinforces the action of stovaine. The period of latency between the injection and the first appearance of analgesia is shortened and the emotive shock lessened. The author neglects to quote any cases and is silent on statistics, so that his recommendations receive no practical support for the guidance of the reader.

Phosphorus Necrosis. Zilz. Wiener Vierteljahresschrift fur Zahnheilkunde, October, 1919, xxxv, No. 4.

Prophylaxis directed against phosphorus necrosis in match makers and other artisans now goes back 65 years. At present in England these workers are under regular supervision by dentists and are compelled in self protection to report to the latter whenever they present either toothache or swelling of the jaw. Periodical examinations are made monthly. In the University of Milan there is a chair on occupational diseases under Professor Devoto and under this aegis Vallardi has published a complete monograph on phosphorus industrial poisoning. Of recent years considerable x-ray work has been done in this field. The comparative rarity of phosphorus necrosis appears from the fact that Stieda in 11 years service as physician in a phosphorus factory publishes but two cases in detail. Among the authorities quoted by the author are no names of dentists, stomatologists or oral surgeons, whence it is inferred that the condition is very seldom encountered in dental practice. The author reports a case as follows: the patient had worked in a phosphorus factory as a boy and youth and at 21 left his occupation for the first time to perform his two years military service after which he resumed his occupation. He had always been well and free from toothache until suddenly he noted that four upper teeth were loose.

He was then mobilized at the beginning of the war and as the teeth interfered with mastication they were promptly removed. This act was followed by periostitis with discharge of pus from the alveoli at the area of extraction. Dead bone soon came away in pieces and the cheek became so swollen that the eye was nearly closed. Incision of the soft parts brought away pus and in a short time all of the remaining upper and several of the lower teeth became loose. The superior maxilla and part of the mandible on the right side appeared to be badly diseased with persistence of a fistulous opening under the right eye. The bones were the seat of much osteophytic thickening. The necrotic bone with the involved teeth was extirpated but the patient died of sepsis.

Present Day Plastic Operations on the Face. Gillies. *Journal of the National Dental Association*, January, 1920, vii, No. 1.

From this long article we only quote the author on whole face reconstruction. Few so extensively wounded as to necessitate this intervention survive. It is otherwise with extensive burns which are not incompatible with survival. Possibilities here are limited only by the requisite flaps, for if unlimited flap material can be supplied there is no limit to restitution. Hence if the chest and neck are not involved in the burn there will be enough flap. The best course is to repair one half of the face at a time. Part of the flap is swung up from the chest and the balance from the neck. As a rule the chin is supplied from the chest while from the neck flap are reconstructed the cheek and nose. The writer lays much stress on the tubed pedicle devised by him. No case thus treated has satisfied him completely, but the degree of improvement has been enormous.

Semeiological Value of Leucoplasia Buccalis. Malherbe. *Revue Trimestrielle Belge de Stomatologie*, September, 1919, xvii, No. 2.

The author who is a practising physician at Nantes does not write from the dental viewpoint and his article is devoted largely to a single case in a woman who consulted him for anovular pruritus, with leucoplasia-like lesions which may have been the cause or effect of the pruritus. The perianal region was much more involved than the vulva and the author decided that the lesions were artifacts due to intensive scratching. The cause, or one of the causes, may have been a leucorrheal discharge dating from a miscarriage 6 months before. The author sought first to exclude syphilis and on examination of the mouth found extensive leucoplasia, the presence of which seems to have been unknown to the patient. A colleague who had seen the patient had made a diagnosis of buccal and anovular syphilides and the patient herself was convinced of this and came in reality for a course of injections. Careful examination and interrogation failed, however, to discover any evidence of the malady. The miscarriage could be accounted for on other grounds and the woman was the mother of three healthy children. The vulvoanal lesions were certainly nonspecific. There was no cause apparent for the buccal lesions and the author, despite his diagnosis, is forced to think of a possible congenital transmission of the taint expressed as the buccal manifestation only, other stigmata being absent. Unfortunately there is no mention of a Wassermann test.

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EDITORIALS

The Necessity for More Careful Technic in Working Plaster

PLASTER of Paris and similar materials for the taking of impressions and making of models form a very important part in the practice of dentistry and especially orthodontia, yet, there is nothing that receives so little consideration in the hands of the average practitioner as the technic of manipulating plaster. How long this substance has been employed by the dental profession could only be determined by going back into the history of dentistry a great distance, but it is safe to say that improvement in technic has been very slow, in fact little advance has been made within the memory of the older practitioners. It is true that different investment compounds and cast materials have been produced since attention has been called to the shortcomings of some of the materials, but even in the face of the elaborate instructions by the manufacturers the dental profession has not taken time to master the technic required for their successful use. The profession has been more interested in short cuts, than in following a definite technic that would give the same result each time.

Plaster of Paris and similar materials have been employed in arts and crafts for many years and date back to the history of the ancient nations. Some of the best technical skill in the use of plaster is found in the manufacture of cheap plaster art work. Dentists have not given the proper time necessary to master the working of these materials, and consequently operations involving the use of plaster have suffered and in many instances results have been unsatisfactory.

Considering the use of plaster as impression material, the majority of the dental profession seem to think it is unpleasant, disagreeable and uncomfortable to the patient and difficult for the operator to use. Practically all of these objections, both from the standpoint of the patient and operator, will disappear when one has mastered the technic. The first requisite to success is familiarity with the material to be used, knowledge of the rapidity with which it sets, and the thickness of the mix required to give the most satisfactory impression. One must also know the condition of the tissues in the mouth, for the mix of plaster that might be indicated in one operation would result in a failure in another. The physical properties of the material must be well understood to enable the operator to obtain the impression in the shortest possible time and thereby eliminate a great amount of the unpleasant results that occur when impressions are allowed to remain in the mouth over a longer period than is necessary.

Mixing of plaster is one technical procedure which dentists have almost universally neglected to grasp. They have failed to make a mix that is free from bubbles and that presents a smooth consistence. Desirable results cannot be obtained by carelessly throwing a lot of plaster into water and then giving it a few stirs to mash the lumps. Neither can results be obtained by pouring a quantity of water into the plaster and then giving it a few whips with the spatula. In other words, the average man does not consider plaster of sufficient importance to become familiar with; when, as a matter of fact, a good plaster impression will often be the dividing line between success and failure. Those who have given thought to this subject know that there is no material that will make so satisfactory an impression in orthodontia or in the majority of dental operations as will plaster.

Plaster and associated materials, when used in making a model, also require a definite technic. When used in the making of a cast it must be so mixed and placed in the impression as to avoid air bubbles. In the use of investment compounds in the making of inlays and castings, we have been told that one of the greatest sources of failure is the developing, or rather occurrence of bubbles in the material during the time it is being mixed; this could be entirely avoided by mastering the technic of manipulating the material. In pouring models over which castings are made, bubbles will appear in the model unless precautions have been taken to prevent them.

The accuracy required in orthodontic work cannot be obtained with any other material than plaster, regardless of the great desire of some to use a material requiring less time. After a good impression has been secured, the operator must also have mastered the technical procedure for varnishing the impression so as to produce a first class model. Then the model plaster must be properly

mixed and placed in the impression in such a manner as to avoid bubbles. A good model can only be obtained by following a definite technic.

It has been our good fortune to attend postgraduate courses given by Dr. Hall and Dr. Roach, and to observe the careful technic they follow in the use of the impression and model materials. Many of their excellent results are obtained through the skill with which they use the materials. When we observe the careless manner with which their students manipulate the same materials, it is easy to see that the student will never equal the master until he practices the same definite technic. From experience in postgraduate work in orthodontia, we are convinced that the average orthodontist does not know how to work plaster. Unfortunately, after they have had instruction in the proper use of these materials, we find a great many still using inferior materials. Many unsatisfactory results develop in dental operations because of this negligence on the part of the operator. There is no one thing that will give a greater return than a more careful technic in the use of plaster and associated materials.

ORTHODONTIC NEWS AND NOTES

The editors desire to make this department a permanent feature of the Journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

Erratum

We have received a communication from Dr. F. H. Berry, a Dentist of Milwaukee, informing us that he is not the Dr. Berry connected with Feder-spiel's Dental Polyclinic. The doctor we refer to is Dr. John Jackson Berry, a graduate of, and for several years an instructor at, Washington University Dental School.

Notes of Interest

Dr. William W. Woodbury announces the resumption of his practice at 17¾ Spring Garden Road, Halifax, N. Y. Orthodontia exclusively.

Dr. H. B. Tileston, Jr., announces the removal of his office to suite 719-720 Starks Building, Louisville, Ky. Practice limited to orthodontia exclusively.

Dr. A. LeRoy Johnson announces the removal of his office to 125 Marlborough Street, Boston.

Dr. A. W. McClelland of Montreal, has moved his office from Birks Building to suite 606 Drummond Building. Practice limited to orthodontia.

Dr. Walter S. Watson announces the removal of his Brooklyn office to 98 Fort Greene Place, Brooklyn, New York. Practice limited to orthodontia. New York office, 576 Fifth Avenue, Monday, Thursday and Saturday.

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ORIGINAL ARTICLES

MODELING COMPOUND AS AN IMPRESSION MATERIAL FOR THE ORTHODONTIST*

BY JAMES DAVID MCCOY, M.S., D.D.S., LOS ANGELES, CAL.

*Professor of Orthodontia and Radiography, College of Dentistry,
University of Southern California*

IN suggesting the use of a material which has for nearly a generation been relegated by the majority of orthodontists to the position of second choice, the writer realizes that his judgment will be questioned and his motives assailed. Such an attitude of mind is usually manifested toward any one who has the temerity to advocate anything which falls without the pale of that which common usage has established as orthodox.

Plaster of paris has been so generally and so universally used by the orthodontist as an impression material that the mere suggestion by anyone that it might be partially or wholly replaced by another material which would satisfactorily fulfill its function and perhaps have some advantages which might make it preferable to the other, to many will sound thoroughly illogical. Even the writer will not dispute the fact that with plaster of paris perfect impressions can be obtained which will form the basis for the production of accurate and beautiful models. This being the case, the question naturally arises, why should any other material be considered as a substitute?

In considering this question let me first call your attention to the fact that the successful orthodontist of today is handling patients whose average age is far younger than it was a decade ago. For this reason it is important that we employ methods which are adapted to these younger patients, and as the matter of obtaining impressions is usually one of the first acts of treatment it should be robbed, if possible, of any unpleasant features.

*Read before the Seventh Annual Meeting of the Pacific Coast Society of Orthodontists, Feb. 16, 1920.

That plaster of paris is not a pleasant material to use in the mouth must be admitted by all. If anyone will take the trouble to take double impressions of several children's mouths using plaster of paris for one and modeling compound for the other and then ask the children which was the least unpleasant, he will find that modeling compound will receive the vast majority of votes. This fact alone is sufficient to make the orthodontist consider carefully the more frequent use of this material provided, of course, it is possible for him to obtain impressions with it which will produce accurate, beautiful models.

There is still another advantage connected with the use of this material which is worthy of mention, viz., after the impressions are obtained the work of making the model is attended with less difficulty and a great saving of time. Most busy orthodontists do not attempt to make their own models, but have them finished by their assistants, and it will be found that the average assistant will handle the model work better and more expeditiously with less effort when this material is used in preference to plaster.

One of the chief causes of prejudice against modeling compound as an impression material (for the orthodontist is due to the fact that in the past the



Fig. 2.—The tray should have high sides similar to a plaster tray, but it should be without a front or a handle.

technic of handling it has been careless and improper with the result that models made from it were inaccurate and well deserving of the accusation they received of being "sloppy."

This material should not be considered as eligible for use unless the operator is willing to use a correct and exact technic. Before outlining a technic the author ventures the opinion that any one who is willing to carry it out in detail will after a little experience be gratified with the results obtained.

The three most important factors of this technic may be enumerated as follows:

1. The selection of a proper tray.
2. The proper preparation of the modeling compound.
3. Proper handling of the compound while in the act of making the impression.

The ordinary plaster impression tray is quite unsuited to modeling compound. After considerable experience in trying various trays, the writer has finally adopted a tray of his own design. This is an aluminum tray without a

handle, with high sides, but with the front cut out (see Fig. 1). The amount of cut-out must be sufficiently great so that when the tray is placed in the mouth the sides will only extend forward to a point just posterior to the canine eminence. When placed in the mouth, such a tray will bring the modeling compound under pressure in contact with all portions of the dental arch except that portion which corresponds to the cut-out portion of the tray. This portion is ignored as it is obtained separately after the balance of the arch has been secured.

As has been mentioned before, it is necessary to have a generous cut-out in



Fig. 2.—The inaccurate portion is cut back to the point where the impression is good.



Fig. 3.—The anterior portion of the impression is removed separately.



Fig. 4.—The two portions of the impression are then united and the union made permanent.

the anterior portion of the tray. The absolute necessity of this will be shown later.

In heating the modeling compound care should be exercised. A water thermometer capable of registering at least 140° Fahrenheit should be utilized. A glass or a porcelain dish capable of holding a quart of water serves as an easy means of immersing the compound. It should be placed in the water with its temperature about 120 degrees. This should be gradually raised either by means of an electric heater or simply by slowly adding hotter water until the temperature has been brought up to between 130 and 140 degrees. During the process of its heating the material should be kneaded between the fingers so that

it may become uniformly softened. All of this requires but a very few minutes and can be carried out by the assistant. When ready to be placed in tray the operator selects the proper amount for the upper tray, adapts it in and to the tray and after a final immersion in the water places it in position in the mouth.

When the tray with its contents has been brought to its proper position it should be held firmly in place. It may then be chilled by cold blasts of compressed air or by the use of cold water. Regardless of which method is employed it is very important that it become well chilled before it is removed from the mouth.

After the preceding steps have been carried out a very accurate impression



Fig. 5-A.



Fig. 5-B.

Fig. 5.—This illustration, as well as Figs. 6 and 7, show models made from compound impressions. They are not exhibited as prize models, but simply illustrate average results.

will be produced of the upper arch, with the exception of the portion lying between—and usually including—the canine teeth. Upon its removal this inaccurate portion of the impression is cut away to the point where the impression is good, a sharp line of demarkation being made (see Fig. 2). The impression is then placed back in the mouth and made to occupy its natural position. While being held firmly with one of the fingers of the left hand pressed against the vault of the tray, a small portion of compound is adapted against the anterior portion of the arch, the lip being lifted for this purpose. This done, the lip is allowed to come down in contact with the material and should be gently pressed against it. This added portion of the impression is then thoroughly chilled and

removed separately (Fig. 3). This is easily accomplished if the anterior portion of the impression has been properly cut back.

The larger portion of the impression is then removed from the mouth and the two sections fitted together. When their proper relationship has been established, the modeling compound should be fused at several points with a hot instrument so that the union may be permanent (Fig. 4).

The same procedure is carried out in taking the impression of the lower arch. This is usually accomplished with less difficulty than is experienced in taking the upper, and for this reason the temptation often arises to take the



Fig. 6-A.



Fig. 6-B.

impression all at one time rather than to resort to the sectional method. This will almost invariably bring about inaccurate results which will be chiefly characterized by distorted impressions of the anterior teeth.

Trays of ample size should always be used for both the upper and lower so that the sides of the impressions will have sufficient body to allow for properly trimmed model bases (Figs. 5, 6 and 7).

While impressions of the majority of cases may be obtained with the trays so far described there is always a possibility of cases presenting themselves in which a degree of deformity exists which will require that the impressions be taken in more than two sections. Such cases may still be taken in modeling

compound by using a Supplee tray and making each impression in five sections, or, if needs be in these rare cases, plaster of paris may be resorted to.

The writer has already mentioned the element of time in using this material. The actual time spent in taking compound impressions using this technic, probably exceeds that which is necessary when plaster of paris is used; but, even so, the matter of time is not a serious consideration as this technic may be carried out to the very letter and satisfactory impressions obtained of both the upper and lower arches with the total amount of time spent not exceeding fifteen minutes.

In preparing an impression for pouring, it should first be thoroughly dried out either by compressed air or by allowing it to stand a sufficient length



Fig. 7-A.

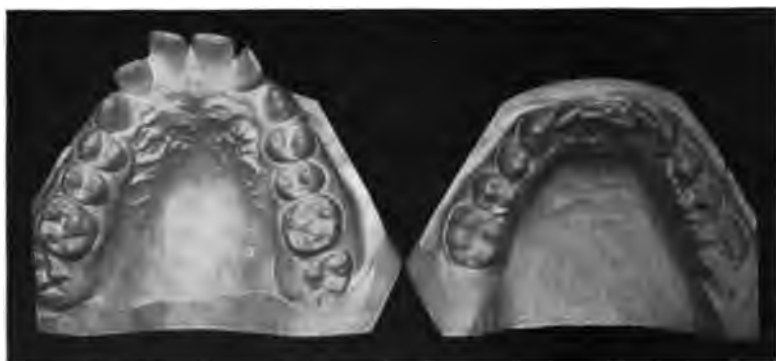


Fig. 7-B.

of time, so that all surface dampness is removed, and then it should be given a light coat of very thin sandarac finish. This varnishing is not done with the idea of acting as a separating medium but simply as a means of insuring a better finish to the model surface. After the varnish has become thoroughly hardened, the model is poured in the usual way, care being taken to avoid the formation of air bubbles.

After the plaster has become crystallized, the impression may be separated from the model. This process should be carried out with due care and accuracy if satisfactory results are to be obtained. The poured impression is immersed in hot water, the temperature of which should be 120 degrees. There should be no

guess work in this matter, but an accurate thermometer should be utilized. The water in the dish should then be gradually raised until it has been brought to a temperature of 130 degrees. After the impression has been immersed at this temperature for three minutes the impression material may be readily and easily removed.

It is a great mistake for the assistant to attempt to carry out the separation process without the aid of a thermometer as invariably she is apt to get the water either too hot or too cold, or, what is just as imprudent, to heat it up too rapidly. Where the impression is not properly heated all the way through, teeth will be broken off when it is removed, and, on the other hand, if it is too highly heated it is apt to melt upon the model resulting in the discoloration of the plaster.

In conclusion the writer recommends modeling compound as an impression material for the orthodontist. First, because it is less objectional to our little patients than is plaster of paris. Second, because it renders the process of model construction less irksome to the assistant. Third, because if properly handled it can be made to satisfactorily fulfill its function.

The method, undoubtedly, will not appeal to some, but it should not be condemned until it has been given a fair trial, and such a trial entails its use under proper conditions, utilizing a technic in keeping with an exact procedure.

DISCUSSION

Dr. Arthur W. Soby, San Francisco, Cal.—In beginning our discussion of Dr. McCoy's paper, let us first see what the authorities have to say concerning the matter. By the authorities, I mean those orthodontists who have given our specialty sufficient study to be competent to write books for the guidance of the graduate as well as the student.

Dr. E. H. Angle says: "The reliability and value of these models is only in proportion to their accuracy, and the nearest approach to accuracy is in models made from plaster impressions. It is frequently stated by those writing on this portion of the subject that models sufficiently perfect can be made from impressions taken in modeling compound or other of the plastics. There is no better fact known in dentistry, however, than that an impression of the teeth made with modeling compound or any of the plastics can only remotely approach accuracy, even when they are in normal position. The shape of the jaw, etc., makes the removal of a plastic impression without change of form, impossible. It is quite probable that those who object to plaster impressions have never taken the time to properly learn the correct method of taking them, otherwise they would find but little, if any, more trouble to themselves or objection from the patient, than if one of the plastics were used."

Dr. V. H. Jackson says: "Impressions of irregular teeth should be made in plaster of paris, at least until one has, through trial, become sufficiently expert to take them accurately with some of the modeling compounds. When the impression is taken in compound, the surface of the model is generally smoother than when taken in plaster; it is quickly made, and the procedure is more agreeable to the patient."

Dr. B. E. Lischer says: "The construction of accurate plaster models * * * is now considered a necessary detail * * *. To obtain this accuracy plaster should invariably be used for the impression from which the model is made."

Dr. Martin Dewey says: "In order that we may obtain the best impression possible—for without a good impression we cannot have a good model—plaster must be used. Modeling compound has a place in dentistry, but not in orthodontia."

So, of four prominent writers, three are positively opposed to the use of modeling compound, while the fourth favors it to the extent of devoting *two pages* to an accurate explanation of its manipulation and desirability, as opposed to *one paragraph* given over to

the use of plaster of paris. But, we must take into consideration the fact that these books were written several years ago—long before Supplee was taken seriously. Are not many prosthodontists today taking their impressions in modeling compound and getting an undreamed of accuracy? Yet, most of the textbooks give plaster of paris preeminence. Examine the illustrations used in our books on orthodontics—how many of them are of children under ten years of age? When those books were written regulating was rarely attempted until "all the teeth were in place."

It is my opinion that Dr. McCoy has done a big thing for us and for orthodontia by his courage in bringing before us a subject that is sure to receive violent and antagonistic criticism. Rest assured that he would not do so until he had given the subject much thought, and what is of greater importance, a thorough investigation and complete working out of detail in his own practice. What he says you may pay careful attention to and feel that it is not of mushroom growth, but of careful and painstaking study and work.

A STABLE AND EASILY ADJUSTED LINGUAL LOCK FOR USE WITH REMOVABLE LINGUAL ARCHES

BY LOWRIE J. PORTER, D.D.S., NEW YORK CITY

Instructor in Orthodontia, College of Dental and Oral Surgery, New York

Clinical Instructor in the Dewey School of Orthodontia

MANY difficulties have been experienced in developing an efficient, stable lingual lock which can easily be placed in position in the mouth, can be easily removed for adjustment and yet is not clumsy and irritating to be used on the lingual surfaces of the teeth.

The author first wishes to name a few of the qualifications of a lingual lock which he has attempted to develop with the new lock herein described.

1. Facility of locking in position.
2. Facility of removing from mouth.
3. Ease of adjustment.
4. Stability of appliances when locked in place.
5. Ample body to attach spring wires.
6. Not bulky on lingual side of teeth.

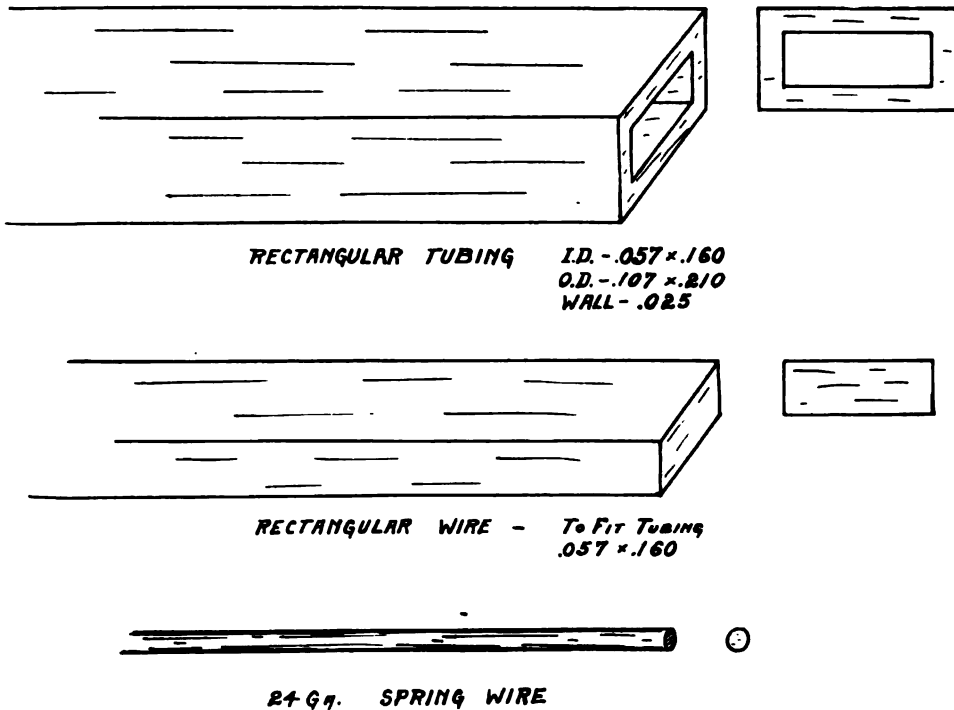


Fig. 1.

A great deal has been done for our profession in advancing the use of the lingual appliances and it is only with that idea in view that the author presents

this appliance for the trial of others who possibly have also experienced difficulties with lingual locks.

This locking device consists of a small rectangular tube fitting laterally over a lug soldered to the lingual of the molar bands and locked in place by a 24 gauge spring wire fitting into a groove in the lug.

Materials used are as follows (Fig. 1).

1. Rectangular tubing .057 x .160 inside x .025 wall.
2. Rectangular wire. .057 x .160 rectangular wire to fit tubing.
3. Spring wire. 24 gauge spring wire.

The author has been using tubing and rectangular wire made of gold, platinum and palladium, but experiments are being made to test other metals for

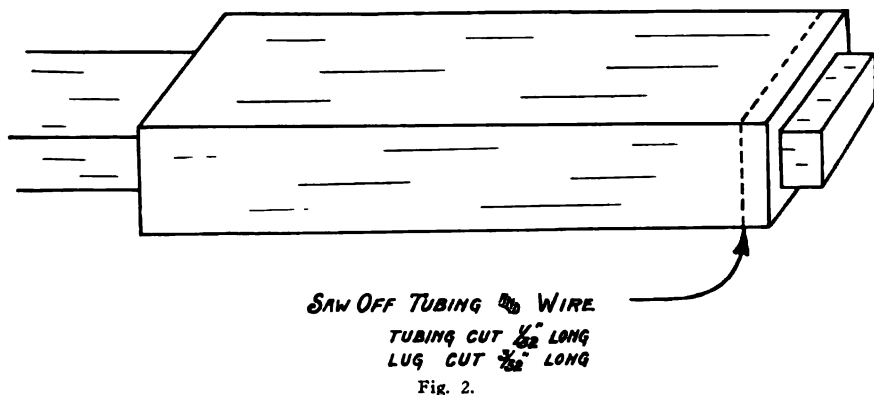


Fig. 2.

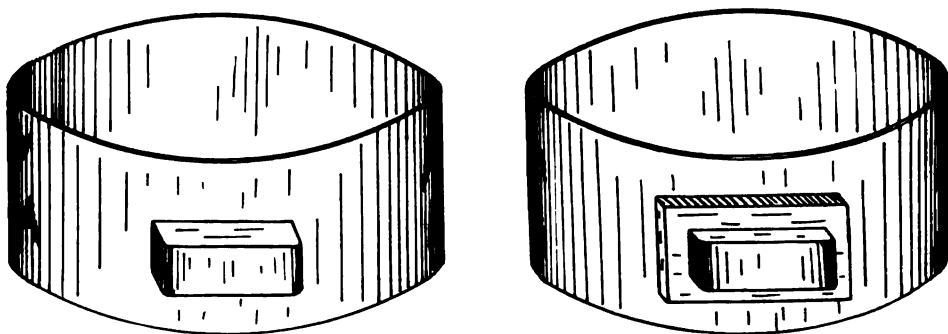


Fig. 3.

this purpose. The tubing is cut into lengths $\frac{1}{2}$ " long and the rectangular wire into lengths $\frac{3}{32}$ " long.

The simplest way to cut these is to extend the wire through the tubing the desired length so that a groove may be cut to receive the spring wire and then saw the tubing and wire off together (Fig. 2).

The lug should now be soldered on the lingual of the molar band and the edges filed slightly so the small piece of tubing will easily slip over it and fit tight to the band (Fig. 3).

Place the bands back on the model and shape the lingual arch as desired. The author uses 18 gauge gold platinum wire as a stabilizing wire to which springs, etc., may be attached.

Now notice about the position that one of the tubes should be soldered to this lingual wire. Remove the tube and lingual wire and solder free hand (22 Kt. solder). Place back on the model with the tube over the lug in position. If the arch does not rest in the exact position desired the lingual wire is heated to a cherry red and pushed to place where it will stay and leave no spring on the molar locks.

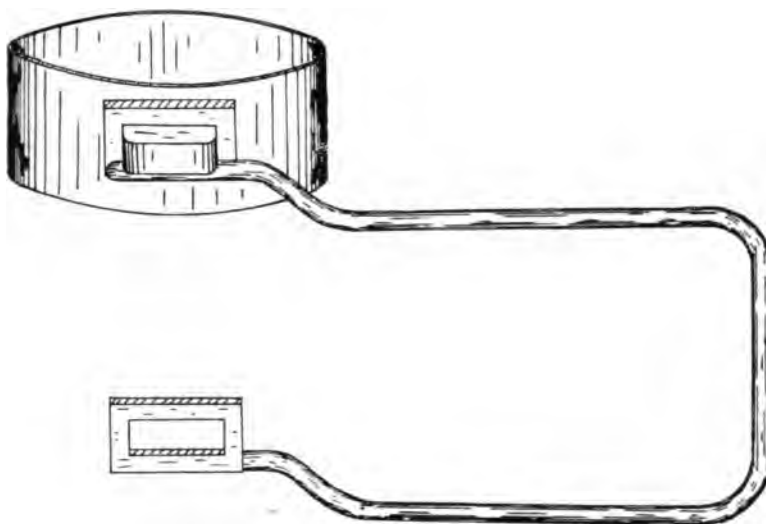


Fig. 4.

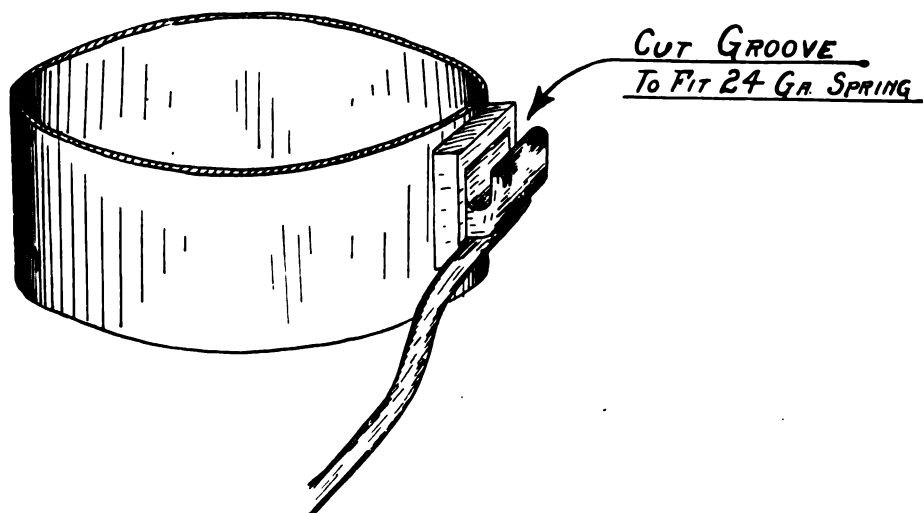


Fig. 5.

Now solder the opposite tube to the lingual wire and repeat the adjustment described.

This makes a lingual arch as in Fig. 4. Now any springs, finger extensions, etc., may be added with 18 or 16 or 14 Kt. solder as desired.

The arch and springs should be allowed to cool slowly after soldering, then

boiled in acid to clean and then polished with a fairly hard polishing wheel at high speed. This gives a very springy, well-tempered arch.

After the appliance is completed, a knife edged disc (carborundum lightning disc) or a saw, is used to cut a groove a little over half way through the lug and tight against the tube while in position on the model (Fig. 5). This is to receive a 24 gauge spring to lock the appliance in place. Now slightly bevel the end of the lug and smooth on all surfaces so there can be no place for irritation to the tongue.

The locking spring may now be attached with 14 Kt. solder. This is attached on the gingival edge of the lingual wire carried distally and bent up and

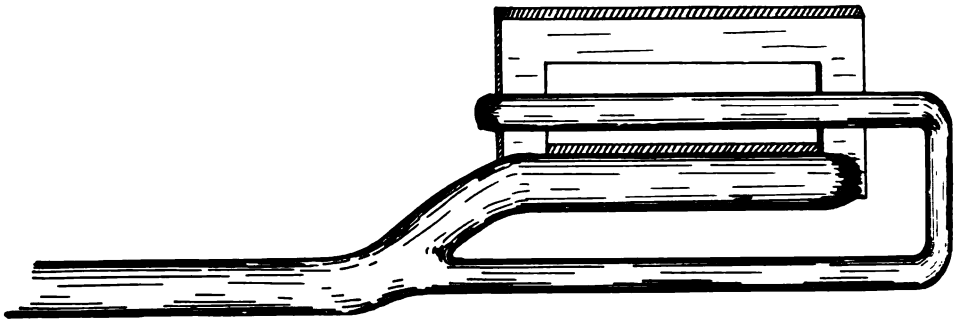


Fig. 6.

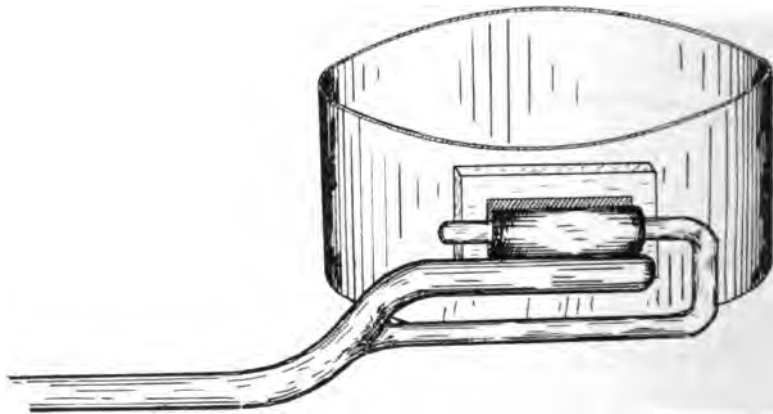


Fig. 7.

over the lug to fit into the grooves. Thus it is impossible to dislocate the lock by any biting on the appliance (Fig. 6).

The locking spring should extend slightly to the distal of the tubing so it may be gripped with a pair of tweezers, pliers, or an excavator, and lifted occlusally. The lock may then be removed from the lug by pulling lingually on the spring wire. It is exceedingly simple to remove. However, it is just as simple to place in the mouth. By placing the finger over the tube and locking wire, and pushing over the lug, and at the same time pushing the locking wire occlusally, it will snap into position and securely lock automatically.

It will be found that this lock because of the rectangular tube and lug is very stable when put in place and it is not at all bulky in the mouth. Fig. 7 shows a

detail of the locking device and Fig. 8 shows a completed appliance ready for placement in the mouth.

It is well to cement both bands attached to the appliance as a retainer, and leave for a few days before adjustment. Thus no movement of the anchor teeth is assured.

The appliance may then be quickly removed, cleaned and any springs for expansion, etc., be adjusted and the appliances easily and quickly replaced in the mouth with no trouble to the child or the operator and it will be found to be very stable after being locked into position.

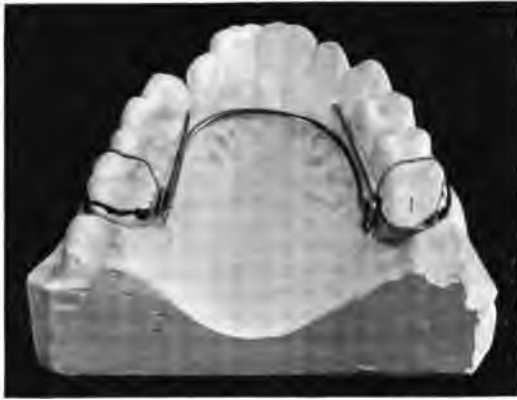


Fig. 8.

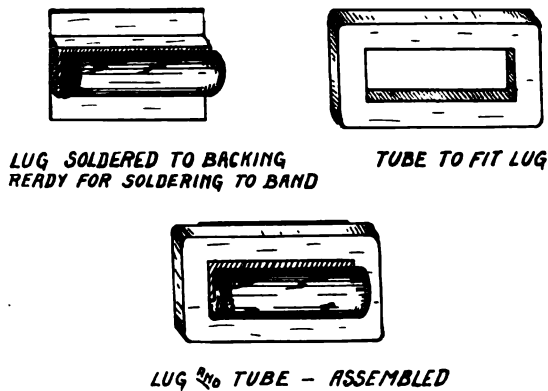


Fig. 9.

At present arrangements are being made to have these locks made as in Fig. 9. They then will have a backing soldered to the lug and to which the tube will seat very accurately. The lug may then be soldered to the band and the tubes soldered to the arch.

Thus it will be very simple to construct a lingual arch with this attachment and the time saved in removing, cleaning, adjusting and replacing the lingual arch will save much time and greatly please the operator, I believe.

This device serves a very good purpose when used on retainers, either active or passive, as well as on active lingual arches.

THE RELATIONSHIP OF FORM TO POSITION IN TEETH AND ITS BEARING ON OCCLUSION*

(Continued from page 444.)

BY MILO HELLMAN, D.D.S., NEW YORK CITY

3. THE EVOLUTION OF FORM AND OCCLUSION OF PRIMATE TEETH

CONSIDERABLE emphasis is being brought upon the shortening of the muzzle in the evolution of certain types of placental mammals. This process is invariably associated with modifications in the dentition. Thus, there is a two-fold effect brought about in the character of dentition where such processes were operative. Though the result as far as the muzzle is concerned is alike in both instances, in that there was an elimination of teeth, the regions involved differ. In the Felidae, for instance, shortening of the muzzle may be associated with the posterior part of the dental arch, the number of teeth in the molar region *mainly* and in the premolar region *in part* being reduced. In the Primates, the part of



Fig. 12.—Dentition of *Pelicodus Trigonodus*. Lingual aspect, showing upper tritubercular and lower tuberculo-sectorial molar and their occlusion. It also shows the higher level of trigonid and its wedged position between the upper molars, and lower level of talonid and its lapping adjustment over the lingual cusp of upper molar. (After Gregory.)

the dental arch mostly affected is the anterior region, one of the incisors, and the first and second premolars being eliminated. Furthermore, the great variability, in the number of incisors and premolars prevalent in various mammals, becomes more stabilized in the New and Old World Monkeys, Apes and Man. The dental formula of the New World monkeys differs from that of the Old World monkeys in the unnumber of the premolars† and in the pattern of the cusps and teeth.

*Read at the Annual Meeting of the American Society of Orthodontists, St. Louis, Mo., April, 1919.

†The Hapalidae differ from the Cebidae also in that of the molars; thus the premolar formula of the former being $\frac{3}{3}$ and their molar formula $\frac{2}{2}$, while that of the Cebidae is p. $\frac{3}{3}$ m. $\frac{3}{3}$. The formulae of the same teeth in the Old World Monkeys is: p. $\frac{2}{2}$ m. $\frac{3}{3}$.

Like the evidence by which the homology of the dentitions of the lower placental mammals was followed, so also may be traced the influences of evolution on the teeth of the primates. The dentitions of the earliest discovered members of this order divulge stages in the evolution of the molar that mark the further steps in the course of perfection of the tooth patterns in the Anthropoid Apes and Man. Thus, as far back as in the lower Eocene epoch the primitive Primate *Peliodus trigonodus* like its contemporary placental mammals possessed the tri-tubercular upper molar and the tuberculo-sectorial lower molar. As can be observed in Fig. 12 presenting the lingual aspect of a portion of the right dentition in occlusion, the anterior moiety (trigonid) of the lower molar is still on a higher plane than the posterior position (talonid). The occlusion, as mentioned before, is of the wedging and lapping type (Gregory), the trigonid fitting into triangular interdental spaces between the upper molars, while the talonid laps the lingual cusp of the upper triangular molar accommodating it in its basin (fossa).

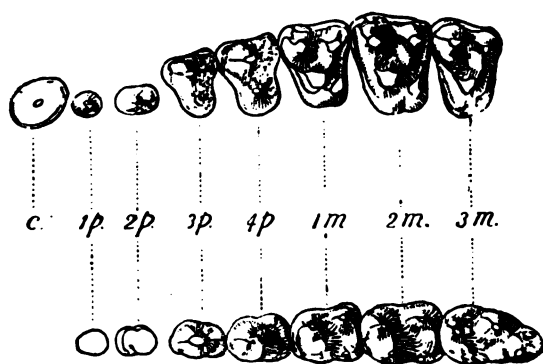


Fig. 13.—Dentition of *Pronycticebus*, Eocene primate of Europe. Showing development of the disto-lingual cusp (hypocone) from the palatal cingulum, and the tuberculo-sectorial lower molars. (After Gregory.)



Fig. 13-A.—Lower dentition of *Dryopithecus fontani*, a Pliocene ancestor of the Anthropoids, showing type of lower molar inherited by the Anthropoids and Man. (After Gregory.)

The next step in the course of evolution marks the beginning in the development of the fourth cusp, the disto-lingual cusp (hypocone) of the upper molar and the further progress in the perfection of the cusps on the heel of the lower molar (hypoconid, entoconid and hypoconulid). Thus, the earliest manifestation of the disto-lingual cusp (hypocone) of the upper molar in primates is found in the Tarsioids *Pronycticebus*, Eocene of Europe (Fig. 13) and *Omomys* sp. Eocene of Wyoming.

Coincident with the primate acquisition of the fourth cusp in the upper molar, other modifications become manifest. Thus, in the upper molar region the triangular interdental spaces become obliterated, while in the lower, the levels of the *trigonid* and *talonid* become more uniform, eventually reaching the same plane. At the same time, the mesio-lingual cusp (paraconid) of the original trigonid in the lower molar is lost. Thus, at about the *Lower Pliocene of Europe*, *Dryopithecus fontani*, a forerunner of some of the modern anthropoids, presents the pattern of the lower molar which is inherited by the modern great apes and man (Fig.

13A). The occlusion of the four cusped upper molar and the Dryopithecus type of lower molar is further perfected in that the disto-lingual cusp of the upper molar (hypocone) is accommodated into the original trigonid basin (mesial fossa) of the lower molar; the mesial marginal ridge alone constituting the mesial boundary without the paraconid which is lost. The mesio-lingual cusp (protocone) of the upper molar, as in primitive dentitions, is still accommodated into the talonid basin (central fossa). Thus, Fig. 14, though illustrating the occlusion of the teeth of modern man, (lingual aspect) thoroughly conveys the idea of the chief characteristic features involved in the occlusion of the quadri-cuspid upper molar and the Dryopithecus-like modification of the tuberculo-sectorial lower molar.



Fig. 14.—Dentition of European White. Lingual aspect, showing the type of occlusion reached in evolution by the acquisition of the hypocone in the upper molar and Dryopithecus type of lower molar. (By courtesy of Dr. Fred A. Peeso).

4. ON THE FORM, POSITION AND OCCLUSION OF THE TEETH OF THE ANTHROPOID APES

The teeth of the Anthropoids resemble closely those of man. They are alike in number and occlusion but differ somewhat in form and position. The Anthropoid Apes include the Gibbon, the Orang, the Chimpanzee and the Gorilla.

THE GIBBON

The Gibbon (*Hylobates*) is the lowest genus of the anthropoid family, and in its dentition is furthest removed from man. The form and position of the Gibbon teeth (Fig. 15A, B, C, D, E,) though apparently resembling those of the teeth of man have certain characteristics that distinguish them as ape-like. Thus, the sabre-like canines, the cingulum on the lingual side of the upper incisors (Fig. 15D), the lower canines and the sectorial type of the lower first premolar are distinctly Anthropomorphous. The upper molars, as may be seen in the same figure, though rounded in contour, are rhomboid in form and quadritubercular. They

possess the primitive trigon and the talon. In position, they retain the primitive character; i.e., the mesio-distal axis is obliquely external; in other words, the mesio-buccal axial angle projecting buccally beyond the buccal surface of the tooth anterior to it. Thus, as the occlusion is of the primitive type, the protocone of the upper molar fitting into the basin of the talonid (central fossa) of the lower molar and the hypocone of the upper molar into that of the trigonid (mesial fossa) of the lower molar, the position of the anterior moiety of the lower molar depends upon the position of the hypocone. Therefore, if the part of the upper tooth-crown bearing the protocone is everted, then, that bearing the hypocone will be inverted. The trigonid of the lower molar behind will consequently correspond to the position of the hypocone as it is accommodated into

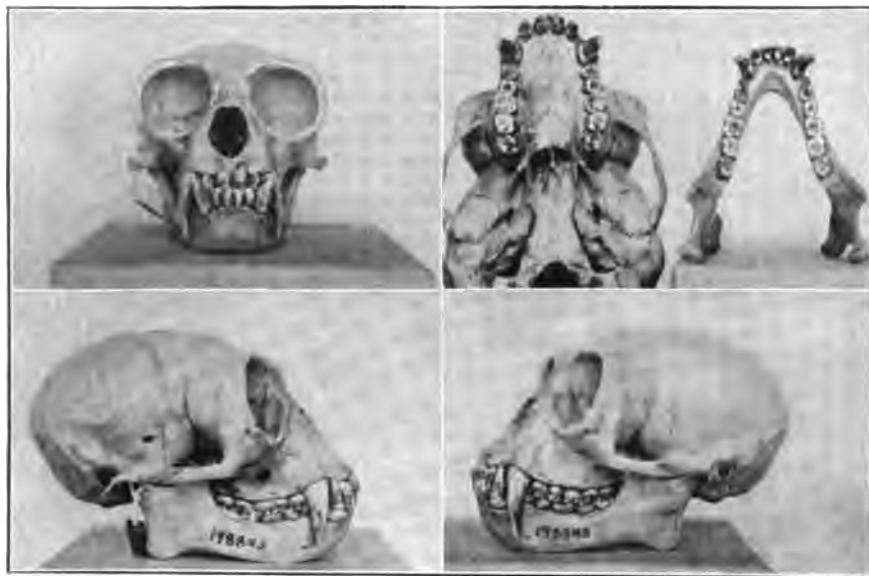


Fig. 15.—Gibbon Dentition in Occlusion. A.—Front view. B.—Right side view, showing normal occlusion as in man. C.—Left side view, showing normal occlusion as in man. D, E.—Occlusal view of both jaws, showing lingual cingulum on upper incisors and lower canines, position of upper canines and molars as regards their mesio-distal axis lingual position of premolars, labio-lingual axis of lower canines directed antero-posteriorly. (U. S. National Museum.)

its fossa. This may, therefore, cause a difference in the antero-posterior axis of the molars in the upper and in that of the molars in the lower jaws effecting at the same time diversity in the associated arch forms. This is just what happens. As has been shown elsewhere* the forms of the upper dental arches of the anthropoids are not always of the same outline as those of the lower.

The incisors, though resembling the human teeth in form, are smaller in size and present a marked lingual cingulum in the upper. This cingulum, when prominent, converts the lingual surface into a mesio-distal groove accommodating the incisal edges of the lower incisors when the jaws are in apposition and the teeth are in an overbite relation. The incisors are arranged in an evenly curved arch and may occlude in an edge-to-edge or overbite manner. They are more vertical in their long axis in the gibbon than in any other genus of the anthropoids.

*Dimensions Versus Form in Teeth and Their Bearing on the Morphology of the Dental Arch, *Internat. Jour. of Orthodontia*, v, No. 11.

The canines are, in proportion to the other teeth, of enormous length, the upper being sabre-like in form and longer than the lower. Their labio-lingual diameter is considerably less than that mesio-distally. In the upper jaw the mesial edge points antero-externally and the distal edge postero-internally, which with the aid of the premolar position give the dental arch a *lyriform* appearance. (See Fig. 15D). Though there are several modifications in the variety of arch forms, this seems to be the prevailing one for the gibbon, mainly on account of the form and position of the canines and premolars. The canines are not only raptorial but also sectorial in function. The upper canine occluding with the lower canine anteriorly and the first premolar posteriorly, constitutes an efficient piercing and shearing apparatus.

The lower canine on the other hand presents a considerably greater labio-lingual diameter than that mesio-distally, due to its very large lingual cingulum. Its position is in alignment with the incisors from the labial aspect. From the lingual, the cingulum of the canine, is in proximation with the mesial surface of the first premolar. Though there is no diastema between the lower canine and first premolar, there is ample room thus created for the accommodation of the upper canine for its functional activity.

The premolars in the upper jaw are bicuspid, and in the lower, the first is sectorial and the second molariform, their occlusion being of the wedging or interlocking type.

The position of the sectorial type of first premolar in the apes is very much like that of the carnassial tooth in the carnivora. That is, they are obliquely set, their mesial surface being turned more lingually than that of the teeth posteriorly. The upper premolars exhibit a tendency to a position lingually in the conformation of the dental arch as compared to the rest of the buccal series. And frequently this produces a decided anomalous condition, in which the upper occlude lingually to the lower. The absence of the diastema between the lower canine and first premolar would indicate an effective protection to the soft tissues in that region during functional activity.

THE ORANG

The most significant manifestation in the dentition of the orang (*Simia satyrus*) (Fig. 16, *A, B, C, D*), is a considerable increase in the size of the teeth as are also the proportions of the entire animal. The enamel covering the crowns presents manifold and manifold crenations on the lingual surfaces of the upper incisors and the occlusal surfaces of the premolars and molars of both jaws, an adaptation probably for a frugivorous diet. So variable and numerous are these crenations as to obliterate at times the *Dryopithecus* pattern of the ridges and grooves on the occlusal surfaces in the premolar-molar series. The upper molars like those in the Gibbon are rhomboidal, quadrilobular and rounded in contour. Their tritubercular origin is still recognizable though the hypocone is added. The lower molars are derived from the tuberculo-sectorial type, the entire occlusal surface being now on one level; they are of greater dimensions mesio-distally than bucco-lingually. The paraconid as in the Gibbon is also lost and the talonid is fully retained. Their position and occlusion are fundamentally of the primitive type.

The canines are as a whole comparatively shorter than those of the Gibbon, though variable in length and of proportionately greater labio-lingual diameter. Their form is more tusk-like in character and their position quite different from that of the Gibbon. Thus, the mesial surface of the upper canine is not directed

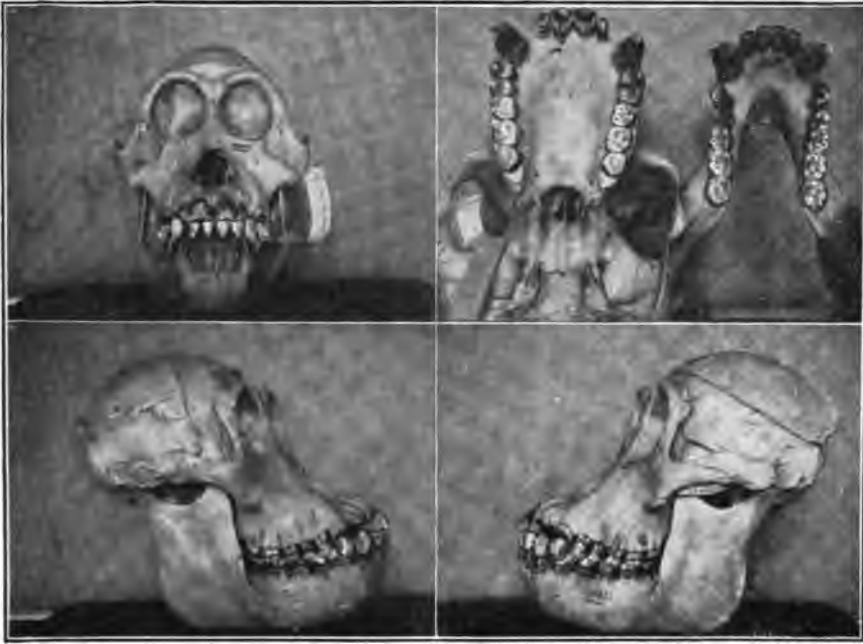


Fig. 16.—Dentition of Orang. A.—Front view. B. Right side view, showing normal occlusion as in man. C.—Left side view, showing normal occlusion as in man. D, E.—Occlusal aspect of both jaws, showing position of various teeth in their conformation of the Pyriform-arch. (U. S. National Museum.)



Fig. 17.—Orang Dentition, side view, showing extreme curve in the longitudinal axis of the incisors. (U. S. National Museum.)

antero-externally but ranges from an anterior to a medial position depending on the form of the dental arch (compare Figs. 16, *D* and 15, *D*). The lower canine though still occupying an homologous position to that of the gibbon has the cingulum directed more lingually. Also their vertical position is modified, the cusp points projecting away from the alveolar process.

The upper central incisors are very much larger than those in man and the laterals comparatively very small. They may vary considerably in their longitudinal axis. Thus, while some present a gradual curve, from root apex to incisal edge, as in Fig. 16 *B* and *C*, in others there is such an exaggeration of this ten-



Fig. 18.—Orang Dentition, side view showing overbite relation of incisors. (U. S. National Museum.)



Fig. 19.—Upper Dentition of Chimpanzee. Occlusal view, showing position of canines and premolars in the lyriiform arch. Note also primitive position of molars. (Am. Mus. Nat. Hist.)

dency as to present a sharp bend at the junction of the crown and root simulating almost a right angle (Fig. 17). Like in the Gibbon the incisor relation is of an edge-to-edge or overbite type. The latter when appearing is greatly accentuated as seen in Fig. 18.

The premolars are bicuspid in the upper, sectorial (the first), and molariform (the second) in the lower. Though having no striking characteristics, they exhibit a slight tendency to be rotated upon their long axis. In occlusion, they present the interlocking type.

THE CHIMPANZEE

The most striking feature in the dentition of the Chimpanzee (*Anthropopithecus troglodytis*) is the more regular deposition of enamel upon the crowns of the teeth, the less curved incisors, and the lingual position of the premolars in the conformation of the upper dental arch. The characteristic lingual migration of the premolars like that in the Gibbon is so prevalent as to produce the lyriiform arch, (Fig. 19,) and at times even exceed the limit of normal variation and establish anomalous modifications, as in the case of the Gibbon dentition. The upper canines especially in the male are bulkier in their dimensions and present a characteristic curve in the longitudinal axis of the crown resembling that seen in the canines of the wild boar, though not quite so emphasized, the tooth being much smaller. The lower canine has no noteworthy distinctions from those mentioned in conjunction with the Orang dentition.

The molars are very much of the same form, similarly placed and in like occlusion as in the Orang. The crenations observed on the lingual surface of the upper incisors and the occlusal surface of the premolars and molars of the Orang are also observable in the Chimpanzee though to a lesser extent.

As will be shown on some future occasion, the Chimpanzee presents the closest resemblance to man in its anomalous characteristics associated with the occlusion of the teeth.

THE GORILLA

In the Gorilla, (*Gorilla savage*) the humanization of the form of the teeth has progressed considerably, except as to proportions (Fig. 20). Though of considerably larger dimensions, the molars have acquired more human-like cusps, ridges and grooves. The upper molars are quadritubercular and more quadrangular in contour than those of the other apes and man. Their antero-posterior diameter in contradistinction to that of the other apes and man is greater than the transverse. The cusps are pronounced, the ridges triangular, and the oblique ridge in the upper well defined. Owing to the large metacone, (distolingual cusp in the upper), and to the peculiar form of the dental arch, their primitive position is somewhat obscured though not changed (see Fig. 20 C). The lower molars are mesio-distally more elongate than those of the other anthropoids and usually present additional cusps in the lower third molars besides the five fundamental ones. The occlusion, nevertheless, remains typically primitive.

In form, the incisors resemble those of the chimpanzee, the upper central being broad and shovel-like while the laterals are proportionately very small. In their longitudinal axis they are almost straight (see Fig. 20 B). The lower incisors are more alike in size. Their position is quite prognathous and the occlusion as in the other apes may be either edge-to-edge or overbite. The canines are tusk-like and in the upper their mesio-distal direction is usually parallel with the buccal cusps of the premolar-molar series varying slightly. The lower ca-

nines are aligned with the incisors and though its lingual surface does not face the mesial surface of the first premolar, it still deviates from the radial direction in man. The long axis of the crown is less curved than in any of the other apes, giving them a projecting position. Of the premolars, the upper are bicuspid, the lower first sectorial and the second molariform. This occlusion is of the wedging type.

The crenations observed in association with the upper incisors, premolars and molars in the orang and chimpanzee are not to be found on the teeth of the gorilla though some folds may be seen in their place resembling more those on the teeth of man.

To sum up what has been said in relation with the anthropoid dentition, it may be reiterated that although there is a close resemblance in the dentitions of

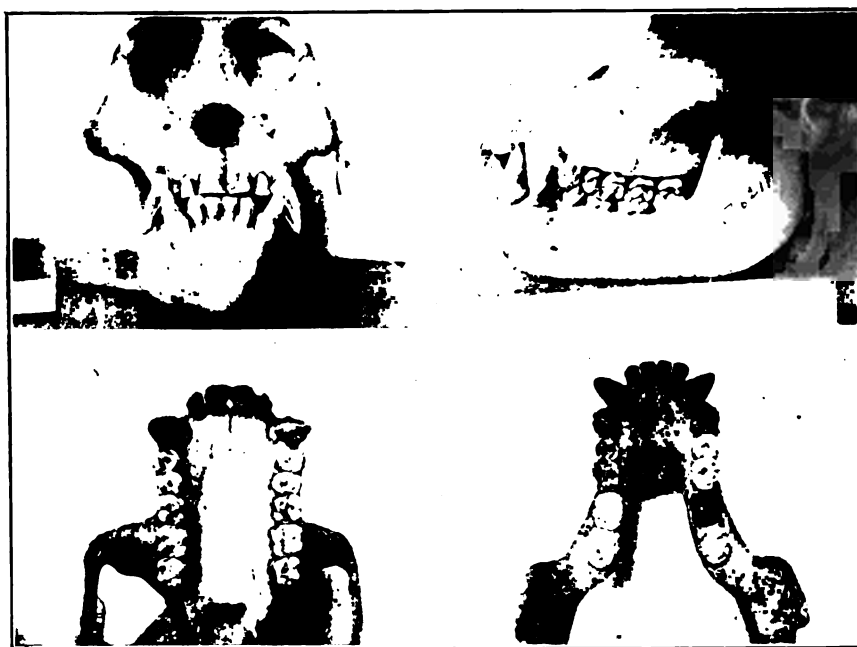


Fig. 20.—Dentition of Gorilla. A.—Front view. B.—Left side view, showing normal occlusion. C.—Occlusal view, showing contour of molars, forms of cusps and triangular ridges, etc. D.—Occlusal view of lower dental arch, showing different positions of canines and molars and difference in arch forms. (U. S. National Museum.)

the Gibbon, Orang, Chimpanzee and Gorilla, there are many points of variance: Thus,

1. The incisors though similar in external appearance vary extremely in size. The mesio-distal dimension of the upper central incisor of the Gibbon, for instance, varies from 3.5 to 7 millimeters while that of the Orang varies from 8.5 to 16 mm.

2. *The incisors also vary in form.* In the Gibbon, the upper incisors though presenting a smooth surface lingually possess a marked cingulum. In some cases this projection is so prominent as to exhibit a decided groove, between itself and the incisal edge. The incisal edge of the lower incisors is accommodated into this groove when present. In the Orang, the cingulum is not as conspicuous but

the entire lingual surface of the homologous incisors is traversed by crenations, (or wrinkles) of variable design and number. In the Chimpanzee, those crenations are not quite as numerous and marked, while in the Gorilla, they are absent.

3. The incisors vary in position. Thus, in the Gibbon, they assume almost a vertical position, in the Orang, there is a marked curve from root apex to incisal edge tending to exaggerations, in the Chimpanzee, this condition is less evident, while in the Gorilla, the teeth are almost straight in their long axis and are prognathous.

4. The occlusion of the incisors of the anthropoids, as in the lower order of mammals, is expressed either in an edge-to-edge or overbite relation.

5. The canines vary in form from the sabre-like structure of the Gibbon to the tusk-like appearance in the Gorilla.

6. They also vary in position in that there is a certain amount of rotation on their long axis observable as in the position of the canine in the Gibbon when compared with that of the other apes. Thus, in the Gibbon, the mesial surface of the upper is everted, while that of the lower is inverted. Passing on to the Orang, this condition is modified to such an extent as to produce an inversion between the two extremes. The occlusion of the canines is that as associated with a raptorial type of tooth.

7. The premolars are bicuspid in all the apes in the upper jaw, while in the lower the first is sectorial and the second molariform.

8. Their position in the upper jaw is vertical. In the lower the first premolar assumes the diagonal position associated with sectorial teeth while the second follows the position of the molars. Their occlusion is of the interlocking type.

9. The molars are quadritubercular in the upper jaw, a modification of the tuberculo-sectorial in the lower. They retain the primitive trigon to which the hypocone is added in the upper and the oblique ridge connecting the protocone with the metacone is distinct, while in the lower the paraconid has been lost though the rest of the primitive cusps on the trigonid and the talonid are retained. The cusps in the Gorilla are high and triangular, in the Chimpanzee nipple-shaped, in the Orang flat and little marked, in the Gibbon high and rounded. In form, the molars are rhomboidal above and elongate below ranging from the rounded contour in the gibbon and orang to the angular type in the gorilla. Their position and occlusion are of the primitive type with the two distinctive characteristics prevalent. Namely, the protocone occluding into the fossa of the talonid and the hypocone into that of the trigonid.

5. ON THE FORM, POSITION AND OCCLUSION OF THE TEETH OF PRIMITIVE MAN

Seth K. Humphrey in "Mankind" says: "In his physical aspect, man, given anything like normal conditions, develops true to the image predetermined by inheritance, down to the last item in his anatomy. It is a remarkable fact that physical inheritance yields very little to any environmental influences, short of malnutrition, accident and disease—and these three are abnormal conditions. In the usual case, physical response to environment is fairly direct, measurable and understood. In this respect, man is on a level with the animal."

The most primitive records bearing on man, though failing to manifest his *gradual* evolution, contain sufficient evidence to link him with certain extinct

ancestors as well as with some lower forms of living mammals such as the anthropoid apes. Not only that, but also like the anthropoids by the retention of certain primitive features man exhibits a relationship to the placental mammals in general.

The earliest authentic records bearing on the dentition of man are known from a mandible (Fig. 21) discovered in the valley of the Neckar about six miles from Heidelberg. This jaw is the oldest positively dated relic of most primitive human form. The stratum where it was found is about 79 feet below the earth's surface and belongs to the Mid Pleistocene epoch associated with wholly extinct mammalian fauna (Gregory). Owing to the locality in which it was found, this mandible is referred to as belonging to the Heidelberg Man. Although typically human, it presents quite primitive and generalized features. As may be observed, the mandible is extraordinarily massive and con-



Fig. 21.—Mandible of *Homo Heidelbergensis*. Occlusal aspect, showing an oval curve in the anterior portion of the dental arch. (Cast by J. H. McGregor.)

siderably longer than any human mandible of today. But despite this, the dental arch is not very much longer than that of many modern jaws. The ape-like features are seen in the great vertical depth of the body, the breadth of the ramus, the form of the symphyseal region, lacking the chin eminence; though the absence of an "ape shelf" and the occurrence of merely a moderate amount of bony tissue encroaching upon the anterior part of the tongue space are human characters.

The teeth, though retaining many ancestral features, are typically human and no larger than those to be found in some of the modern Australian Skulls.

The incisors are vertical in position and from the evidence of wear must have met their antagonists in an edge-to-edge bite. The canines are stout and do not project above the occlusal plane of the incisors. The first premolar, though having lost the sectorial form and considerably reduced in size, is still

found in an homologous position to that of the anthropoids. The second premolar in contradistinction to that of the anthropoids is larger than the first. Both premolars are rather prominent in the conformation of the anterior part of the dental arch. The incisors, canines and premolars are arranged in an oval curve, so to speak, whereas in modern man they are described as being set in an elliptic or parabolic curve. In consequence of this anterior arch-form the canines appear to be associated in position with the incisors instead of indicating the boundary line between them and the premolar-molar series. As may be noticed in Fig. 21, the labio-lingual axis of the canine is more in an antero-posterior direction in contradistinction to that of modern man where it is more oblique.

The molars are stout but present the primitive relationship of subequal size in the first and second; the third is somewhat reduced. All molars have the full



Fig. 22.—Restoration of the upper jaw and dental arch by Prof. J. H. McGregor, showing the teeth in occlusion with those in the lower jaw of Heidelberg Man. (From casts made by Prof. McGregor.)

complement of cusps with the exception of the paraconid which, as in the anthropoids, is lost. Their transverse bucco-lingual diameter is less than in many modern molars.

The distinctively human features are the vertical incisors, the stump-like canine, the proportions of the premolars, and the pattern and arrangement of the molars. The conspicuous even wearing of all the teeth causes them to resemble those of more recent Man in whom the teeth are worn by the mastication of foods prepared from cereals ground between gritty mill-stones and according to Todd, suggests the probability that Heidelberg Man was already in the habit of masticating certain food products, prepared from crude flour. Whether all human beings belonging to that period possessed the characteristics described can not be averred as the Heidelberg jaw is the only survivor of that race. The interest attached with the remains of this extinct individual has served as an incentive to many scientists for various speculations regarding the probable form

of the features associated with the face and skull. Guided by a thorough knowledge of the characteristics of the various races of primitive man, J. H. MacGregor, Professor of Zoology, Columbia University, New York City, made a restoration supplying the parts above the mandible. Fig. 22 portrays the cast of the original lower jaw in occlusion with the restored upper jaw and teeth. The primitive characters present in the dentition of the anthropoids and man are manifested in the form and position of the various teeth and in the form of the restored upper dental arch. It needs no special mention to realize that more than a superficial knowledge of occlusion is necessary to perfect such a restoration.

(To be continued.)

DENTAL ENGINEERING

(Continued from page 235.)

BY RUDOLPH L. HANAU, BUFFALO, N. Y.

ON page 233, April issue of this Journal, it was mentioned that a flat worn denture represents occlusion. It is not the most desirable occlusion from an all mechanical viewpoint, because of the absence of cusps and cutting edges.

The shearing effect of the incisors is not diminished, in fact, shearing itself becomes more efficient if the lingual edges of the upper and the labial edges of the lower incisors exist and overbite is performed. The function of cutting approaches crushing, the more the incisal crowns are flattened.

The masticating process of the posterior teeth suffers most. The grinding effect is reduced to crushing complimented by inefficient grinding and shearing.

We do not wish to be misunderstood, therefore, let us investigate the flat worn denture from another angle. We shall then find that the flat worn denture, though deficient in general, is nevertheless, the most efficient dental apparatus at least at one stage of the masticating performance. It occurs after the "rough work" has been done, which is possible in preparing and selecting suitable food. For instance, chopped meats, vegetables, fruits, etc., are better prepared for the stomach by a flat worn denture in probably less time and with less effort, than could be expected of a "normal" denture.

We are in this article considering the purely mechanical function of the posterior teeth; viz., crushing, grinding, and shearing. It is also remembered that the tongue and cheek participate in these three operations. The aid and efficiency of the tongue, cheek, and palate in masticating work increases, the softer the food becomes. The function of the teeth is practically eliminated, when we take liquids.

Natural food or food similar to that taken by our early ancestors and by present day "uncivilized" tribes includes dishes even tougher than a lunch room steak. The writer thinks of a delicatessen he had occasion to relish among the Boers, when he was a boy, air-dried meat. This meat becomes very dense and fairly dry. Crushing of such food between flat worn dental surfaces is an utter impossibility. The force required would be too great. Projecting cusps are an absolute necessity. The force imparted by the jaw is concentrated upon points, offset to each other (interdigitating cusps). The consequence is: bending, breaking, shearing, tearing and crushing of the food substance. The operations take place successively (not necessarily in the order given) and simultaneously *in loco* and along the occlusal surfaces. The mechanical function of the tongue and cheek during the period of hard work is of minor importance.

Nature's devices are imitated by man in plants and mills. Ruck crushing machines are built which in principle are nothing but rock chewing apparatus. The working surfaces of these machines have elevations and cavities—*comme il faut*.

Nature's formations are moulded by forces. These forces may be of molecular or muscular origin or applied from without.

It is not intended at this time to dig too deep into those branches of science known as mechanics, statics and dynamics, of which it is known that many an orthodontist does not care to know too much because of their close relationship to mathematics and geometry. Nevertheless be it whispered, the forces in question, of which we all know very little and assume a whole lot, play a predominant part in the formation of all bones and tissue.

Fig. 9 (Fig. 1), in the discussion of Dr. Hellman's paper is a radiogram of a squirrel jaw. It might just as well represent the silhouette of a lobster claw. The cause for the similarity of the mentioned structures could no doubt be traced to forces.

We then refer to some seemingly queer formations brought forth in Dr. Hellman's paper and discussion contra dental engineering, and have this to answer: Don't let us forget that teeth or their equivalents are not of necessity chewing devices. They may have to perform the duties of other tools or of weapons. The whale, e. g., uses its "tooth formation" as a strainer.



Fig. 1. (Hellman.)

The size and shape of the teeth are the most tangible factors in the reconstruction of the human denture, and that is so because the *size and shape can be measured and reproduced*.

Next in line though less absolute stands the formation of the jaws. These are pliable, while the teeth, ordinarily, retain size and shape during treatment.

All other factors of which we know not more, but less, must of course be considered to the best of the Orthodontists ability. There is no excuse for any orthodontist to neglect any one of all factors because of the inconvenience of acquiring the knowledge to master a subject.

An error was found by the writer among the charts published some time ago. Though this error is not a very serious one, it is greatly regretted and herewith apologized for. The writer would have appreciated criticism and a severe reprimand.

Here is something for the next orthodontic critic to approve of, or to disapprove.

A. The size and shape of individual teeth do not alone determine any arch form of contact tooth formation, but they constitute most important factors in the reconstruction of the arch form.

B. All factors, those purely mechanical and others, have a reciprocal influence in shaping an arch form.

C. Forces determine Nature's formations.

D. The size and shape of an *individual* tooth has absolutely no direct or definite relation to the arch form.

The Types Ia, Ib, Ic and Id, have in common, the narrowing of the posterior illustrated in Fig. 5, page 235, April, 1920, issue of the Journal (Fig. 2).

The types Ia, Ib, Ic and Id, have in common, the narrowing of the posterior arch. The curves show a marked tendency to form a closed curve within a distance (measured from the most anterior point) not exceeding one and one-half the width of the arch at the first molar.

Types IIa, IIb, IIc, and IId, have parabolical character. IIc and IId are of a somewhat complicated mathematical form.

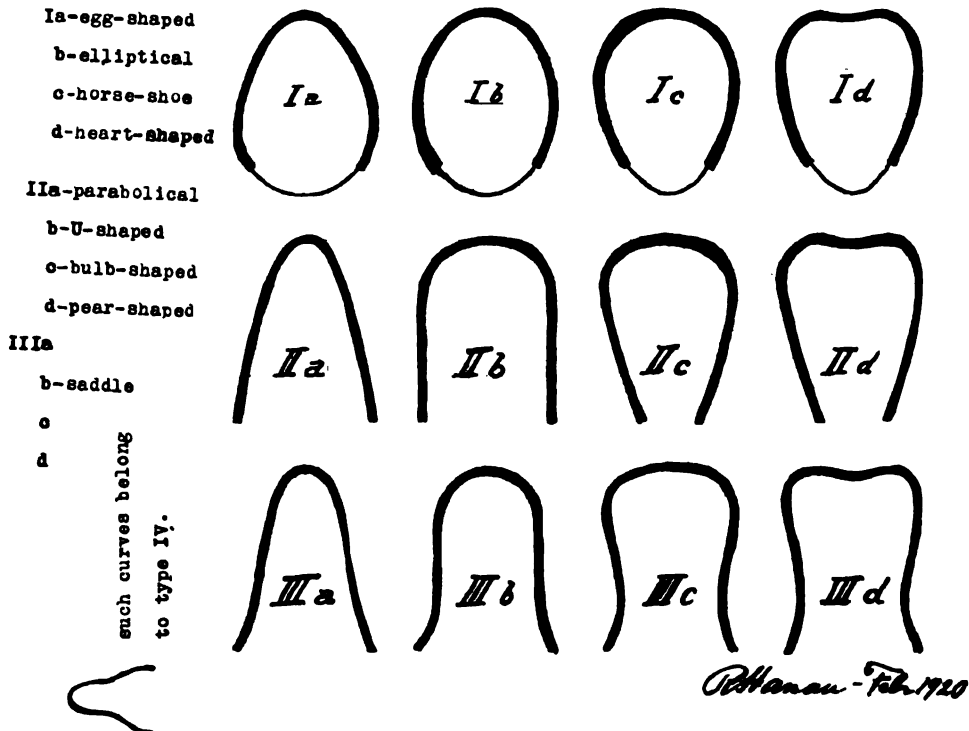


Fig. 2.

Types IIIa, IIIb, IIIc and IIId may, roughly speaking, be traced to the parabolical parent curves. They have in common a helix at the posterior extensions (a gradual change of the C.C.C. from a convexity to a concavity).

Types IV are characterized by the side figure. A second helix is added to Types III posteriorly from the first. The consequence is a second convexity on the C.C.C. at its posterior extension. Investigating Fig. 5 (Fig. 2) further, we find the pointed arches in the first vertical column (a-column) a medium anterior curvature in the b-column, a broad, flattened anterior curve in the c-column and a dented broad anterior curve in the d-column.

The c-types and d-types invariably have prominent canines. The c-types and the d-types are frequently met with in human dentures in the upper in cases of malocclusion.

The C.C.C. of the lower arch in a denture in occlusion is always different from the upper and *referring to the Fig. 5, (Fig. 2) we define: The lower C.C.C. varies from the upper C.C.C. in the anterior portion, by approaching*

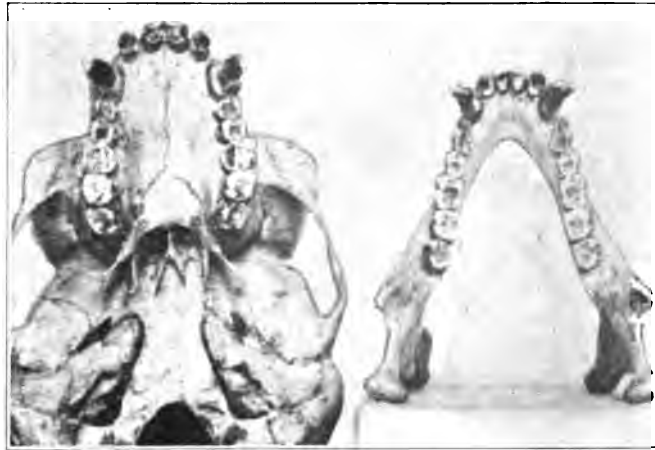


Fig. 3.—Occlusal view of upper and lower dental arch of the gibbon showing position of canine and premolar in the conformation of the lyriform arch. It also shows a difference in arch outline of upper and lower jaws. (Hellman.)

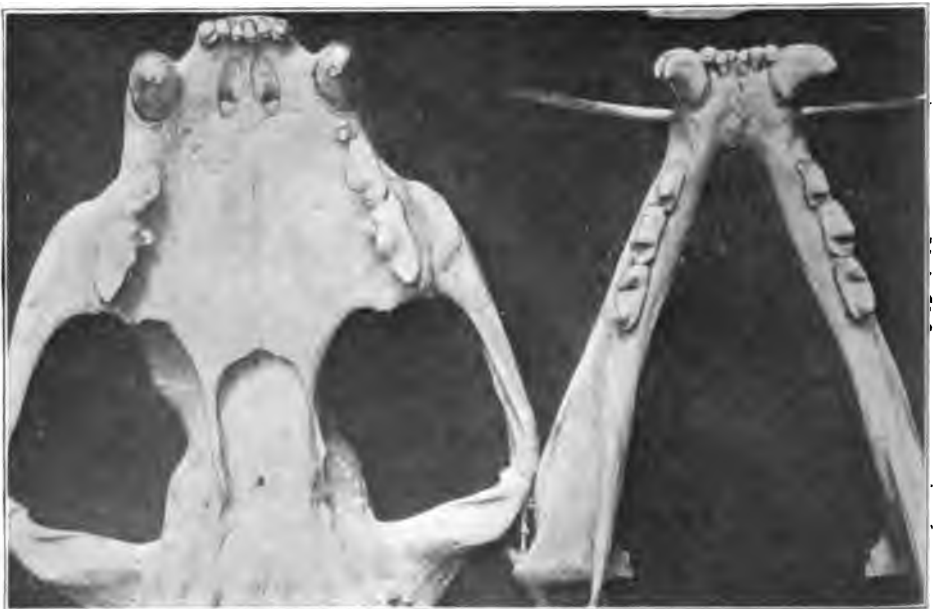


Fig. 4.—Occlusal view of modern carnivore (Puma) showing the extreme modifications in the dentition and the form of arch. (Hellman.)

the characteristics of the type to its left, and varies in the posterior portion by approaching the characteristics of the type below it. This rule applies to dentures having a buccal inclination of the upper posterior tooth crowns. The rule reverses for a lingual inclination of the upper posterior tooth crowns.

It is a surprise to the writer that Dr. Hellman should point out in his Fig. 6, Vol. V, No. 11, of the JOURNAL (Fig. 3) the difference in arch outline of the upper and lower jaw. Such difference is absolutely necessary to establish occlusion for buccally inclined upper and lingually inclined lower posterior tooth crown.



A.



B.

Fig. 5.—Hindoo skull showing dentition in normal occlusion.

A.—Occlusal view of lower dental arch, showing its variability in form from that of the upper.
B.—Occlusal view of upper arch showing considerable difference in form from that of the lower arch. (Hellman.)

Fig. 14 of the same article (Fig. 4), is the occlusal view of a Puma, illustrates a case of *lingually inclined upper and buccally inclined lower posterior tooth crowns*. Note the reversal of the characteristics of the C.C.C's when comparing with Fig. 6 (Fig. 3).

Fig. 21 (Fig. 5) shows a hindoo's dentition, does not seem to be exactly

normal occlusion. The writer would judge that to be pseudo-occlusion of a *set* denture, if occlusion of anterior teeth is satisfactory at all. Of course, the writer has entirely different conception of "normal" occlusion than many an orthodontist.

He distinguishes:

1. Perfect occlusion.
2. Pseudo-occlusion.
3. Malocclusion.

He has never seen the perfect occlusion, but he can imagine it.

Pseudo-occlusion is represented by any satisfactorily functioning dental apparatus which may even have supernumerary teeth or teeth missing, but it must always have harmony of tooth substance or noninterfering compensation thereof. The latter condition may exist in Fig. 21 of Dr. Hellman's article, (Fig. 5).

Malocclusion exists wherever the denture cannot perform its function or interferes in consequence of the position of the teeth with health or esthetics. Malocclusion is not a pathological condition though it may cause or may be caused by such. From the writer's viewpoint malocclusion is a defect. This is an opinion only.

Dentures in pseudocclusion may occur in:

- Dentures having a full complement of teeth.
- Dentures having missing teeth.
- Dentures having supernumerary teeth.

Dentures in malocclusion may be sub-divided in:

- Dentures having a full complement of teeth.
- Dentures having missing teeth.
- Dentures having supernumerary teeth.

Malocclusion interferes with proper functioning of the teeth or it interferes with the functions of other anatomic units directly or indirectly. Various modes of classification of different forms of malocclusion are given by various authors of which the most prominent pioneer is Angle.

Mixed dentures are in pseudo-occlusion or malocclusion. The period of change from deciduous to permanent denture is a period of constant change of occlusal conditions, most critical in the formation of the permanent denture.

DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

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OPERATIONS ON HARELIP AND CLEFT PALATE*

By J. SHELTON HORSLEY, M.D., RICHMOND, VA.

OPERATIONS on harelip and cleft palate, when successful, fill every reasonable demand made upon the science and art of surgery. First, and most important, the operation for harelip and cleft palate is often life saving. These congenital deformities are not directly fatal, but it is well known that but few children born with harelip and cleft palate reach adult life without an operation. They succumb readily to both respiratory and gastrointestinal disease. The function of the nasal structures, that are intended in the normal child to warm the air and to abstract at least some of the floating foreign material from the air, is nullified by the wide open cleft, which permits almost direct access of air to the larynx without the intervention of the protecting membranes of the nose. This predisposes to respiratory diseases and renders the tissues of the pharynx in a chronic state of inflammation, which also predisposes in young children to gastrointestinal disease. The second object that is attained by surgery of harelip and cleft palate is the relief of the deformity and the greater comfort of the patient. A third desirable result is that it relieves society from the sight of an unpleasant object—for surely nothing can be more unpleasant than gazing upon a wide-open harelip—and from the hearing of unpleasant sounds, which any one who has listened to the attempted conversation of a patient with cleft palate can readily appreciate.

Inquiries are often made about the proper time for operation on harelip and cleft palate. The harelip should be operated upon when the baby is two weeks old, or as soon thereafter as possible. If the harelip is accompanied by a complete cleft in the palate, that portion of the cleft that involves the alveolar process is closed by a single wire suture immediately before operating upon the harelip. If the baby is in good condition, usually both of these operations can be done at the same sitting. The cleft of the hard and soft palate is, in my

*Read by invitation at the Tri-State Medical Association of the Carolinas and Virginia, at Charlotte, N. C., February 18, 1920. Published in the Virginia Medical Monthly, June, 1920, xlvii, No. 3.

judgment, best operated upon at the age of about six months. If the operation is not entirely successful, further operation can be done, so that the baby should have a satisfactory palate by the time he begins to talk. This is all that is necessary, and if the palate is holding and functioning when the baby begins to talk, there will be no defect in his speech. If the operation is done earlier than six months, the tissues and palate have not well developed, the bony structure of the hard palate is still very soft, and the shock of the operation is somewhat greater than it appears to be when the baby has attained the age of six months. Of course, if the cleft interferes with the nutrition, or there are other good reasons, the operation can be done earlier. If the operation is postponed beyond the age of a year, when the child has acquired the habit of talking, he will have to be re-educated so as to talk without a defect, even though the palate has been restored to its anatomical normal. This can be accomplished by the assistance of an intelligent voice culture teacher and, if the palate has been entirely corrected, the training of the speech should be persisted in until it becomes normal.

No operation for harelip or cleft palate should be performed unless the baby is in good physical condition. No matter how accurately the sutures are placed, or how gently the tissue is handled, if the baby is in poor physical condition, has been improperly fed, or if the food is not agreeing with him, operation should be postponed until the patient can be built up or the dietary errors corrected. If this is impossible, operation should not be done, as it would almost certainly fail. Babies should be fed either on mother's milk or modified cow's milk. A child that is fed largely or entirely on condensed milk may look well, but will not stand the strain of an operation satisfactorily.

The operation that I perform for harelip is the Rose operation, with very slight modification. It is important to have a satisfactory background for the lip to rest upon, and if there is a cleft of the alveolar process, or if the harelip is a double harelip with a protruding premaxillary bone, this condition should first be corrected. After this, the operation for single harelip demands that the tissues, when sutured together, be free from tension, that the harelip at the point of suture should be slightly longer than normal, and that the vermilion border of the lip should be accurately approximated. In order to secure union without tension, the lip and ala of the nose are freely dissected from the maxillary bone with the knife and scissors. The side of the harelip near the midline needs but little mobilization, but the ala of the nostril should be completely freed. This is sometimes followed by sharp bleeding, which can be readily controlled by firm pressure for a few minutes with dry gauze. The incisions are based upon the principles of the Rose incisions, only instead of using curved incisions I prefer an angular incision. The edges of the harelip are caught with mosquito forceps on the mucous membrane near the lower border of the cleft in the lip. The fingers of an assistant control the coronary arteries and stabilize the lip. An incision is then made in the outer portion of the cleft of the lip, going from the mucosa into the skin about one-quarter of an inch. This incision is carried outward and upward and is made with a sharp-pointed knife. From the end of this incision another straight incision is carried upward and inward to the nasal border of the nostril. The knife incision is carried well through the skin, but the rest of the incision may be completed with scissors. (Fig. 1.) The incision

should go through the lip where it is normally thick, so that when the tissues are approximated there will be the full thickness of the lip along the line of suture. Otherwise, there will be a disfiguring groove. A similar procedure is carried out on the other side of the cleft in the lip and a suture of the finest silkworm-gut is placed through the lower mucosa borders of the lip, but is not tied. It is used as a tractor suture. A through and through stitch of very fine silkworm-gut is placed through the lip just above the vermilion border and near the angle of the incision. This stitch should include a very small bite of skin, but should be

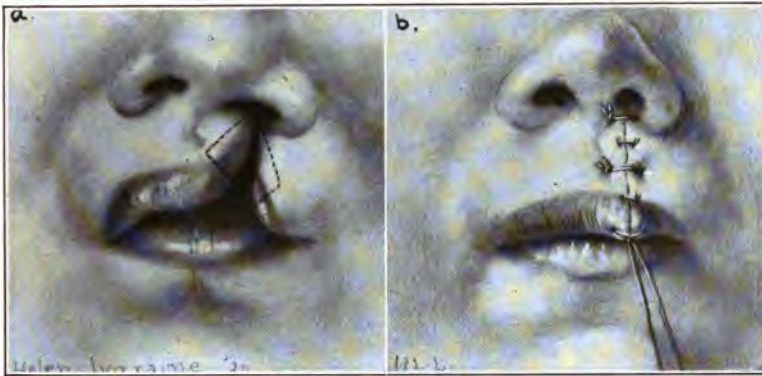


Fig. 1.—(a) The lines of incision for harelip operation. (b) Suturing of the pared edges has begun. Note insertion of the traction suture.

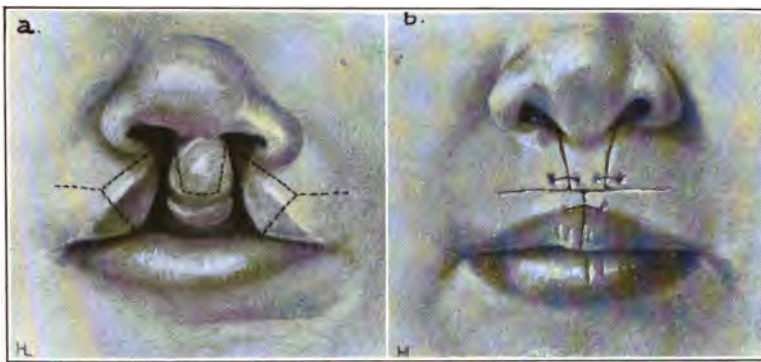


Fig. 2.—(a) The lines of incision for double harelip operation shown by dotted line. (b) Suturing of double harelip after incisions have been made.

carried outward from the incised surface in such a way that a full bite of the musculature and the mucosa is taken. The stitch is carried through to the other side of the cleft in the lip and inserted at a similar point, going from the mucosa to the skin and taking a very small bite of skin, while tension is made on the tractor suture. The first knot in this stitch is tied and the tractor suture is relaxed to demonstrate whether the suture makes the lip symmetrical. If it is not in satisfactory line, half of the suture is withdrawn and reinserted. This is an anchor suture, and is very important. Another silkworm-gut suture is placed near the nostril going through all layers of tissue. It should not be placed

within the grasp of the nostril, for this is likely to occlude the nostril, and it is better to have the nostril a little too widely open, which can be easily corrected later by excising a wedged-shape piece of tissue on its floor, than to have it occluded. In an adult, or an unusually long lip, it may be necessary to put one other through-and-through suture, but the average child only needs two, placed as described. Further approximation is obtained by suture of fine silk. I usually use arterial silk 00000 or very fine silkworm-gut. These sutures go no deeper than the skin or mucous membrane. The wound is powdered lightly with boric acid powder and no dressing is applied and no retentive apparatus, such as adhesive plaster, is used. Formerly adhesive plaster strips running from the cheek across the bridge of the nose to the forehead on the opposite side were used. They were annoying and frequently slipped, and sometimes caused irritation of the skin. I have found that healing without retentive apparatus is just as satisfactory as when the adhesive strips were used, and the patient certainly appears to be more comfortable without them. (Fig. 1.)



Fig. 3.—Slitting mucosa of septum in double harelip in order to make submucous resection to place the premaxillary bone in the cleft. The premaxillary bone should always be preserved and never removed.

The parents should always be instructed to bring the child back in about three or four months after the operation. The lip may be approximated apparently perfectly, and yet during the process of healing there is sometimes undue contraction and a notch will form or one side of the lip will be pulled up a little more than the other, which leaves a slight unevenness at the vermilion border. This should be unsatisfactory to the surgeon, even if it is not complained of by the parents or the patient, and if the parents are informed of this possibility before the operation for harelip, they will understand the situation. If the second operation is necessary, it is a very slight plastic procedure, and will make an almost perfect lip instead of one with a notch or irregularity. The stitches, except the through-and-through stitches, are removed in five days. The through-and-through stitches should be kept in place from seven to nine days, depending upon the firmness of the union.

I believe this operation will be satisfactory in practically any type of single harelip. In double harelip, if there is a premaxillary bone, it is set in place by making a submucous resection of the nasal septum which supports the premaxil-

lary bone (Fig. 3.) The edges of the premaxillary bone and corresponding portions of the maxillary bones are freshened by trimming away the mucous membrane. The premaxillary bone is set back into the gap between the maxillary bones and held in position by a braided wire suture. In an infant, this suture can be passed by thrusting a stout perineal needle with the eye at the point through the soft bone just above the alveolar process and threading the wire through the eye of the needle while it is within the cavity of the mouth. The wire is then pulled through, and a similar procedure is carried out on the other side. The perineal needle is then thrust through the soft tissues just in front of the premaxillary bone, the wire is drawn through and is tied snugly, holding the premaxillary bone fixed. The mucosa of the lip tissue over the premaxillary bone is denuded and the edges of the cleft in the lip are pared somewhat similarly to the paring of a single harelip, only at the angle of the incision a straight

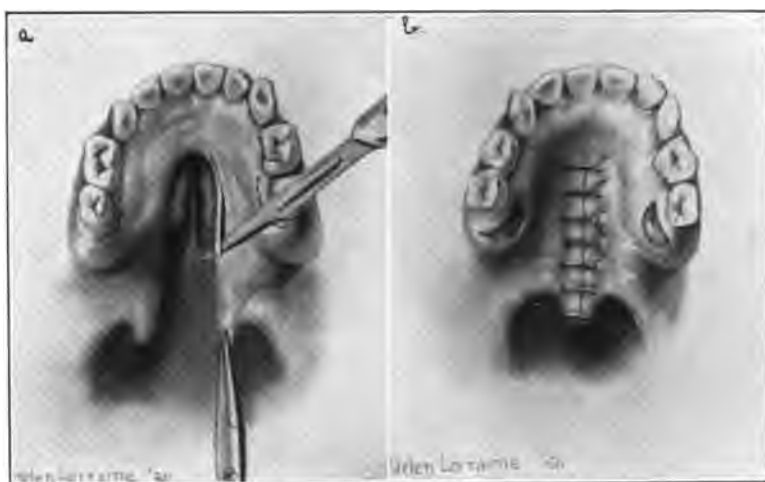


Fig. 4.—(a) Cleft of hard and soft palate, showing method of paring the edges of the cleft. The dotted lines indicate relaxation incisions which are made close to the alveolar process to avoid injuring the posterior palatine arteries. (b) The tissues have been mobilized through the relaxation incisions. The attachment of the soft palate to the bone of the hard palate has been severed and the edges of the cleft are approximated with seven silver wire sutures.

incision is carried outward and slightly upward for a distance of about one-half an inch in order to provide an ample margin for the lip. (Fig. 2.) This flap is sutured to its opposite flap in the midline and through-and-through sutures unite that portion of the lip over the premaxillary bone to the adjoining parts of the lip. These sutures should be fine silkworm-gut. Other approximating sutures may be fine silkworm-gut or arterial silk. (Fig. 2.) The after-treatment is the same as in single harelip.

In cleft palate operations, the ideal should be the same as in all operations; that is, to restore the palate so far as possible to its anatomic and physiologic normal. Various types and modifications have been used, and a number of these I have employed, but I have found that the principle of the old Langenbeck operation comes nearer filling the ideal conditions than any other type of operation. The Lane operation, in which a flap is turned over from one side, including the mucosa over the alveolar process and hinging on one edge of the cleft, and tucked

into a pocket made on the opposite side of the cleft, affords a number of immediate apparent successes, for the cleft is thus readily closed. A large raw surface is left, however, and eventually the scar tissue is so marked that the palate is merely a mass of fixed scar tissue with little or no function except the passive one of stopping the cleft. Such patients have but little use of the muscles of the soft palate and often have pronounced defect in speech.

The operation of Langenbeck consists of paring the edges of the cleft, making a relaxation incision near the alveolar process, and after stripping up the



Fig. 5.—(a) David R., age 10 months. Photographed before operation. Harelip had been operated on unsuccessfully elsewhere, all stitches having broken down. (b) Photograph of the same patient as in Fig. 5a. Photograph taken about 4 months after operation. The patient also had a complete cleft of the palate.



Fig. 6.—(a) Bessie H., 3 weeks of age. Photograph taken before operation. (b) The same patient as in Fig. 6a. Photograph taken 2 years, 7 months after operation. This patient also had complete cleft of the palate in addition to the harelip.

muco-periosteal flap from the bone of the hard palate and separating the fibrous attachment of the soft palate to the bone of the hard palate, the margins of the cleft are united by interrupted sutures. There are certain important points in this operation to insure success. The first is to handle all the tissues as gently as possible. These wounds cannot be protected against infection from food or air, so their natural resistance must be preserved by treating them gently. A second important point is that the relaxation incision should be made as close to the alveolar process as possible and posteriorly it may curve around the process

slightly. If made further inward, the posterior palatine artery is injured and the nutrition of the tissues along the cleft is greatly impaired. A third important point is thoroughly to separate the fibrous attachment of the soft palate from the bone of the hard palate, and the fourth point is to use silver wire sutures, which in themselves are slightly antiseptic, and to put just sufficient pressure upon them to approximate the tissues.

After anesthetizing the patient with ether, the anesthetic is continued by pumping ether vapor through a perforated metal tube, which is held in the corner of the mouth. One-half of the uvula is seized with mosquito forceps and the uvula made tense while a thin ribbon of mucosa is cut from the anterior portion of the cleft to the tip of the uvula. (Fig. 4.) This procedure is repeated on the other side. I prefer this to denuding the cleft after the flaps have been mobilized, because I think a smoother paring can be done at this stage than later on. The relaxation incisions are made just within the alveolar process and are no more extensive than the width of the cleft and the height of the arch of



Fig. 7.—(a) Herbert T., age about 7 months. Photograph taken before operation. (b) The same patient as in Fig. 7a. Photograph taken 2 years, 3 months, after operation. All three of these patients, in addition to the harelip, had complete cleft palate which has been successfully repaired.

the palate demand. A small periosteal elevator is introduced through the relaxation incision and the mucoperiosteal flap is well elevated. This procedure is repeated on the opposite side. Wherever possible, sponge pressure is held over one bleeding surface while the operation is being carried out elsewhere. This minimizes the loss of blood. After the mucoperiosteal flap has been thoroughly mobilized on each side, the fibrous attachment of the soft palate to the bone of the hard palate is divided by a curved blunt-pointed scissors, which are inserted with one blade between the mucoperiosteal flap and the bone and the other just above the bone and the scissors carried down to just posterior to the margin of the bone of the hard palate. The separation at this point is facilitated by retracting the tip of the uvula on that side after grasping it with mosquito forceps. This procedure is repeated on each side. Fine silver wire, about No. 29 or 30, in a sharp curved needle, is inserted through the cleft on both sides about the junction of the hard and soft palate. This is not twisted, but by leaving a clamp on each end of the suture, placing of other sutures is facilitated. About three sutures are placed in front and three behind this central suture, the

others being twisted as they are placed. The sutures should be twisted just tightly enough to approximate the tissues well. The ends are cut off and one or two should be left slightly protruding and not tucked under, so as to prevent suction in the region of the wound by the tongue. (Fig. 4.)

Any extra suturing, such as suturing the posterior pillars of the palate together, or tapes or larger wire carried though the relaxation incisions and around the flaps, is unwise. They either cut off the nutrition while relieving tension, or predispose to infection, or both. No other suture should be placed except those described. The wound may be kept clean by an atomizer containing some mild antiseptic, such as boric acid or an alkaline antiseptic, which is sprayed through the mouth and nose every three or four hours. The sutures are removed in about two weeks, but silver wire sutures can be left longer.

Proportionate successes with this operation increase with experience. If the patient is in good condition and the operation is carefully performed, a majority of these cases should unite perfectly after the first operation. The possibility of some stitches breaking down, however, should be explained to the parents before the operation is undertaken. The surgeon will find that using apparently the same technic, his latest work will be more successful than his earlier work. Formerly I was satisfied with about one-third of the cleft palates healing completely after the first operation, it requiring one or more subsequent operations to complete the closure. In the last five consecutive operations on cleft palate, four have healed perfectly after the first operation and one broke down entirely. This was on a young baby who had been fed with condensed milk and who developed a temperature of 106 degrees three days after the operation. The baby recovered, but all the stitches broke down at the end of the first week. I believe, with care and patience, every congenital cleft palate, no matter how bad, can be closed, provided a competent operator does the first operation. In defects of the palate following syphilis, however, permanent closure is much more difficult and is often impossible.

DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Under the Editorial Supervision of

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It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

SPECIAL EQUIPMENT FOR EXTRAORAL RADIOGRAPHY

BY CLARENCE O. SIMPSON, M.D., D.D.S., ST. LOUIS, MO.

THE great variance in the methods and appliances for extraoral radiography by orthodontists, dentists, and radiodontists, doubtless has had a bearing upon the quality of the results. The lack of suitable apparatus at hand for the operation has been an impediment in the development of routine methods, and the

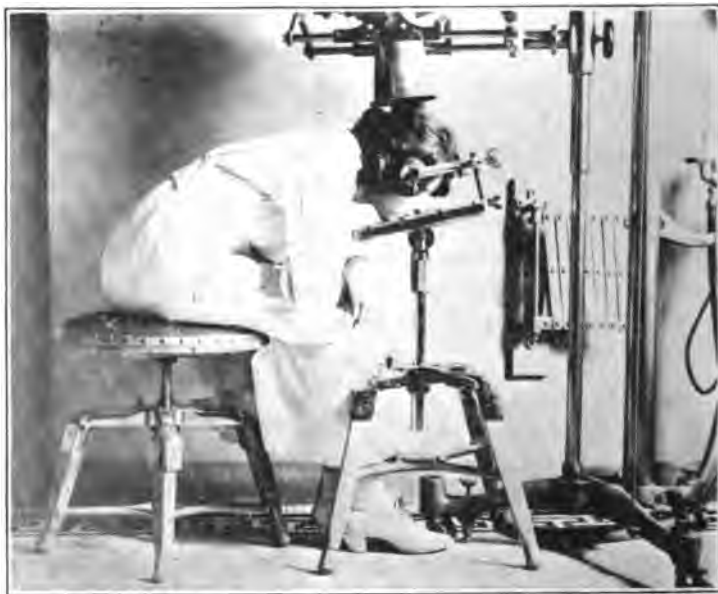


equipment described in this article is suggested with the hope of promoting convenience and efficiency in this useful phase of practice.

Adapting the head rest of a dental operating chair for the patient to lean the face against the plate has been proposed, but is deficient in several features.

Attachments for tube stands have been devised, but a head rest in connection with a tube stand is limited in the range of movement and prone to the complications of most unit construction. The customary procedure is the use of an improvised arrangement of books on a stool or table, which does not create a favorable impression upon the patient or give the operator advantageous working conditions. Usually no means other than the uncertain cooperation of the patient has been employed to maintain immobility during the exposure, although the bandaging of the head to the supporting object has been advised by some writers. These makeshift methods are not conducive to accurate or efficient technic, and through inconvenience discourage the making of extraoral examinations.

Some radiographic tables have an adjustable head rest, but many general radiographers prefer a wedge block placed on the table to support the head. Some use an appliance intended for the localization of foreign bodies in the eye, but most



illustrations of maxillary and sinus examinations show such accessories as books, sandbags, and boxes in posing the patient. No uniformity in operating is evident excepting the orthodox incline at which the plate rests, in itself a minor factor.

The accompanying photographic reproductions illustrate a specially constructed stool and stand, in which the attempt has been made to incorporate the desirable features of different apparatus designed for radiographing the maxilla, accessory sinuses, and mastoids. The seat of the stool may be regulated to any height from 15 to 24 inches, and is 16 inches in diameter to afford a comfortable and stabilizing rest which is one of the essentials in immobilization. The table portion of the stand may be tilted and locked at any angle, rotated, and adjusted to any height from 22 to 33 inches. It is equipped with an aluminum covered plate changing tunnel, and head clamp of standard design. Graduations on the disc under the table, facilitates an accurate setting if a definite angle is desired. The plate changing tunnel permits the removal of plates for stereoscopic views

without disturbing the patient, and accommodates a thin cassette for intensifying screens. The head clamp may be attached in three positions, holding the patient's head secure until released. The pedestal portion of the stand offers a convenient grip and rest for the patient's hands, when this is indicated.

The stand and stool are weighted to 30 pounds each, and the legs are set at an angle which gives a broad firm base. The legs are fitted with rubber crutch tips which compensate for slight inequalities of floor surface, and prevent the sliding of either piece from lateral pressure in posing the patient. Great ease of manipulation, and accessibility to the operation is possible by first placing the



stool in the desired location, and seating the patient at a comfortable height. Then the stand may be placed in a correct relative position, and the patient posed with nothing to obstruct the view or access. Lastly the tube stand is rolled to place and adjusted for the exposure. The space occupied by the equipment makes it attractive for operating rooms which prohibit the installation of a radiographic table, and in practical service it has fulfilled the requirements to a gratifying degree. In a subsequent article, an endeavor will be made to present a rational technic, for extraoral examinations, based upon the variations in anatomical structures instead of arbitrary angles.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Normal Dental Occlusion. Subirana. La Odontologia, January-February, 1920, xxix, Nos. 1-2.

A conscientious study of normal dental occlusion with especial reference to embryology of the mouth, nose and pharynx and a study of many photographs has led the author to the following conclusions: normal occlusion by reason of the extreme facility of perversion is present in less than one per cent of individuals or about 8 or 9 per 1000. This facility is bound up in the omnivorous character of the dentition. The perversions not only alter the facial lines of phonation and mastication, but perturb the relations and modify the form of the bones and buccal muscles and therefore affect the act of nasal respiration. When the embryo and fetus do not evolve normally, these relationships are necessarily affected. Volume, form, and functions all participate in this disturbance. In regard to the mouth and teeth in the embryonal period we see that the lips, cheeks and tongue all play a part in occlusion. The temporary teeth and the permanent teeth during the period of second infancy are factors of capital importance in the development of the jaws. The teeth are maintained in equilibrium by a system of natural forces and if one of these defaults the teeth tend to diverge and the first important consequence is buccal respiration. In general anything which favors nasal obstruction can lead to malocclusion and mouth breathing. In many cases the work of the orthodontist can succeed only if accompanied by the efforts of the rhinologist in overcoming nasal obstructions and vice versa.

The Oculo-Cardiac Reflex as an Element of Diagnosis in the Accidents of Local Anesthesia. Fichot. Revue de Stomatologie, April, 1920, xxii, No. 4.

This article is merely a study of this reflex when the subject is more or less under the influence of cocaine and hence is not necessarily a dental subject. The picture, however, is not a pure one, for the patient is not alone under the influence of a drug but the prospect of an operation naturally throws him into an emotional state. The author terms the actual state a toxi-emotional one. If the amount of cocaine is insufficient to induce toxic phenomena, or if some bland analgesic is substituted, it is evident that the state induced will be purely

emotional and not at all toxic-emotional. This distinction is well shown in the alleged behavior of the oculocardiac reflex which is exaggerated in the purely emotional state but in the toxi-emotional state, abolished or dissociated. The author, however, neglects to give any of his cases, neither does he quote statistics which bear on the matter. It does not in fact appear that any one has as yet done practical work in this field.

Gonorrheal Stomatitis. Chevelle and Georgel. *Revue Trimestrielle Belge de Stomatologie*, June, 1919, xvii, No. 1.

The patient was a young man who developed, some time after cure of a urethral gonorrhea, an intense gingivitis, which was assumed to be of gonorrheal origin although there is no mention of the presence of cocci in the secretions and no history of exposure of any kind. The fact that the affection yielded to anti-meningococcus serum injected into the buttocks may perhaps be regarded as evidence that the condition was of gonorrheal origin, as this remedy is used with benefit by the authors in complicated forms of gonorrhea. The lesions consisted of an intense tumefaction of the gum corresponding to the 6 anterior teeth of the lower jaw. Most of the area was covered with a greyish deposit suggesting sphacelation and the odor of the breath was fetid. Pus collected at the margin of the gum, and salivation was present. The condition resisted the most intensive treatment. Two months after the debut of the stomatitis the urethritis apparently returned, gonococci were present in the pus. This condition yielded in time to appropriate treatment, but the stomatitis persisted unchecked. It was assumed that the seminal vesicles were infected and upon this supposition treatment was successfully directed to this focus and the patient appeared to recover from both urethral and buccal lesions. In a few months both urethritis and stomatitis returned, the latter with the same picture as before. The diagnosis was now forced of metastatic buccal gonorrhea secondary to a focus probably vesicular and for the first time serotherapy was begun. Improvement was rapid and in an interval of about two weeks cure was complete. Metastatic gonorrheal stomatitis is excessively rare although known to exist. Meningococcus serum agglutinates the gonococcus almost as decidedly as it does the meningococcus but in the authors' experience it must be used with great caution as it may cause both serum sickness and anaphylaxis.

Diagnosis of Periodontoclasia. McCall. *Journal of the National Dental Association*, April, 1920, vii, No. 4.

In simple recession the gum and alveolar process alike undergo retraction with exposure of the cementum. Here there is absence of all local reaction. The greatest offender in this condition is the excessive use of the tooth brush but the massage of the gums is of value in preventing infection, as the resistance to disease is greatly increased. The next form of recession is seen in chronic gingivitis which is characterized chiefly by marginal redness and slight tenderness. The cementum is not exposed and there is no pocket formation, no alveolar absorption, no loosening of teeth. Causal factors of importance are roughened

surface of the tooth from any cause, chiefly calculus and prosthetic work. A subdivision is hypertrophic gingivitis, often seen from the irritation of a crown band. Acute ulcerative gingivitis is due to the Vincent association of micro-organisms and usually one of the other forms of gingivitis is already present. In alveoloclasia recession of the gums is associated with retraction of the alveolar process and the teeth are often loose. This condition often follows dental operations and is also in part a consequence of disuse from malocclusion. In periodontal parietal abscess the pus does not issue from the gingival crevice and may form about a live tooth. The symptoms may closely simulate those of apical abscess but there is quick subsidence without pulp canal treatment and the x-ray shadow is characteristic. In suppurative pericementoclasia pockets of pus form and there is absorption of alveolar bone. Pus tends to escape from the gingival margin and the tooth may or may not loosen. There is a combination here of infection and predisposing causes, as food impaction and serumal calculus.

Value of Splinting in Pyorrhea Alveolaris and Methods for Fastening Loosened Teeth. Neuman. *Zahnaerztliche Rundschau*, May 18, 1920, xxix, No. 20.

The fixation of loose teeth is an important factor in the treatment of pyorrhea. Whatever other measures are taken, splinting will be absolutely necessary. The constant movement of the teeth in the periodontal space is a continuous cause of renewed inflammation. Recently it has been shown by a histological study of 20 cases by Fleischmann and Gottlieb that atrophy of the bone is the original and first cause of pyorrhea and from this viewpoint splinting of the loosened teeth is imperative, in all cases in which more than half of the alveolus is absorbed, this degree being determined from the x-ray appearance. This norm is of course arbitrary and others may prefer another. It should also be understood that the corner pillars are in condition to serve as anchors. A single tooth should never be depended on. The author discusses the choice of a splint and states that a choice lies between only a few. He prefers personally splints which carry out the principle of Rhein of New York, this requiring the previous solid filling of roots.

Nasodental Cases. Schubert. *Zahnaerztliche Rundschau*, April 6, 1920, xxix, No. 14.

The author gives several cases in which the teeth and nasal fossae were simultaneously involved. In one there was a dental fistula communicating with the nose. The woman patient had complained for some time of inflammation and marked crust formation at the left nasal opening. There was tenderness over the root of one left incisor and the pulp was found lifeless. The tooth was trephined and the pulp treated. It became evident that an abscess had pointed into the nasal cavity with resulting fistula formation. The apex of the tooth was resected and it was found that the front portion of the alveolus of the affected tooth had largely disappeared. The tooth required wiring on account of the removal of its supports. The remains of the root were filled and the sinus curetted. The wire was removed four weeks later. In a second case a right

canine tooth was partly displaced into the nasal fossa. The patient had a typical case of pyorrhea with disappearance of the alveoli, the disease having run a rapid course. It was found that patient was a diabetic, which went far to explain the severity of the case. The upper teeth had mostly disappeared, there being four on the left side and three roots on the right. None was a canine. All of the upper teeth and roots were extracted and an attempt made to conserve the lower teeth as antagonists for a plate. After the extraction an apparent recrudescence of pyorrhea in the toothless upper jaw led to the discovery of a retained canine confirmed by the x-ray. The root of this member was sharply twisted and bent. The tooth was removed by operation, when it was found that it had partly projected in the *apertura pyriformis*. The patient's diabetes appears to be arrested and he is wearing a plate denture with a reconstructed lower natural denture.

Pulpless Teeth in Health and Disease. Machat. *Dental Cosmos*, March, 1920, lxii, No. 3.

The author does not advocate the removal of all devitalized teeth, for in certain cases these are actually indispensable. In allowing the latter to remain they must first be viewed from numerous angles including local and systemic pathology, general physical condition, position of the tooth in the mouth, sex, age, occupation, number and outline of roots, prospect of restoration, value as abutment and occlusal function. Then in the absence of streptotocemia the tooth may be reopened, sterilized, ionized, refilled and perhaps have the apical third resected. Well filled and resected roots are not exempt from infection and the author has repeatedly found cocci present when such teeth have been finally extracted. In subjects with low resistance to infection it is unwise to leave devitalized upper molars in the mouth because of the likelihood of maxillary sinusitis. The author lays much stress on the condition of the blood and blood pressure as an index for the advisability of conservation. In 90 per cent of cases of closed streptococcus infection the blood pressure, hemoglobin index and red and white cell counts are all abnormally low. In the balance the blood pressure is normal or high. Generally speaking the author does not extirpate normal pulp. When ordinary measures fail to sterilize he has recourse to ionization which has not, however, always been successful. He has evolved a law of procedure which does away with indefinite repetition of the process—which he once carried out 17 times without success. If on the third attempt the tooth is not disinfected he fills at once, resects, cauterizes and seals the amputated end with amalgam.

Pansinusitis and Orbital Phlegmon of Dental Origin. Rousseau-Decelle and Bercher. *La Revue de Stomatologie*, February, 1920, xxii, No. 2.

The patient was an officer aged 28 who was admitted to a military hospital for orbital phlegmon. The left eyeball was in irreducible exophthalmus. Both lids and the conjunctiva were markedly swollen but the pupil, fundus oculi and vision were unaffected. The dental examination showed a badly implanted second premolar. There was a history of constant escape of pus from the left

nostril dating back a month. Just before admission the patient had developed chills and fever with painful swelling of the left cheek and ocular region. Temperature was 40° C. The diagnosis having been made of maxillary sinusitis the antrum was punctured through the meatus with escape of fetid pus. Next a counteropening of the sinus was made at the canine fossa through which the antrum was curetted. The instrument appeared to show that the posterior ethmoid and anterointernal part of the orbital bones had undergone necrosis. Despite transient improvement from the drainage there was a secondary formation of pus opposite the ascending process of the superior maxilla which broke outwardly at the cheek. Some days later curettage of the antrum brought away sphacelated ethmoid bone and in 5 days more still another piece of bone was detached. The ethmoid was then curetted through the nose and a portion of the process of the superior maxilla resected. The frontal sinus long remained intact but when it was sought to close the antrum permanently, this cavity developed an infection and it became necessary to perform a radical operation as parts of the anterior, inferior and internal walls had undergone necrosis. The patient was in the hospital for nearly four months between admission and discharge.

Artificial Dentures in the Esophagus and their Extraction by Esophagoscopy
Control. Mateos. La Odontologia, January-February, 1920, xxix, Nos. 1-2.

The author reports 5 personal cases from his rhinolaryngoscopic clinic at Murica. The observations agree closely among themselves. The patients were first x-rayed and then after anesthetizing the passages, the esophagoscope was introduced and the foreign body removed. In two of the five cases the plate arrived in the stomach and was expelled by the rectum. The dates of expulsion were 11 and 20 days, respectively. It is necessary at times to break up the plate before extraction. In one case after fragmentation a portion descended into the stomach. For fragmentation the author uses the forceps of Kahler or those of Hill. The resource of pushing portions of the denture into the stomach has been advocated by several authorities, as Botey, Sargnon and Goyanes. Radiography and radioscopy are not perfunctory but indispensable procedures. The exact location, form and dimensions of the plate cannot otherwise be ascertained. In none of the cases described was the menace so urgent that this resource could not be utilized. Only Killian and Brunning are mentioned under esophagoscopy, the author probably being unaware of the work of Jackson and other American operators.

Stomatitis Gangrenosa. W. and O. Wannack. Zahntechnische Reform, May 23, 1920, xxiv, No. 21.

The two authors are dentist and physician, respectively, and last year contributed an article on stomatitis and ulcerosa to which the present is a sequel. Noma is the familiar name of stomatitis gangrenosa. The initial manifestation is a small ulcer with a discolored floor that may begin on the inner aspect of the cheek, fold between the cheek and gum or inner aspect of the lip. The sore enlarges and becomes covered with an ill smelling slough while at the same time the cheek or lip swells and takes on a tense, shiny, pale look or a violet marbling.

The constitutional symptoms are severe from the start. The victims are almost always children who have just gone through some one of the acute infectious diseases. A gangrenous area also appears in the skin while within the mouth the process extends to the bones. The authors give a vivid picture of the disease after the fashion of the older clinicians when minute description took the place of laboratory tests. These passages are prolonged to an extreme extent, but the authors make no reference to any personal observations or even to personal experience of any kind. On the other hand, they do not cite a single authority for their statements, such as a death rate of 75 per cent. There are no bacteriologic allusions, and were it not for the recommendation of salvarsan under therapeutics, one might conclude that the entire text was borrowed from text book accounts of two generations or more ago.

Experimental Tuberculosis in a Monkey. Joseph-Mendel. *Revue de Stomatologie*, February, 1920, xxii, No. 2.

The experiment was carried out at the Pasteur Institute. The right upper central incisor was trephined to expose the pulp and a virulent culture of the bovine bacillus introduced into the pulp cavity which was then obturated with cotton. The experiment was then repeated in the left lower first molar but the obturation was effected this time with cement. Both operations were made the same day—May 20. Ten days later while the lower jaw was negative the upper showed a reaction *in situ*, the gum being congested and swollen. In another ten days the reaction had involved the gum corresponding to all the incisors, while in the lower jaw opposite the tooth of the experiment there was a typical alveolar abscess. This upon puncture gave exit to pus containing the bovine bacillus. There was no evidence of mixed infection. On June 22 the animal was killed and the thoracic and abdominal organs were found to be the seat of a general tuberculous infection. The liver, spleen, kidneys and lungs were strewn with miliary granules. The regional submaxillary lymph nodes were slightly enlarged but contained no bacilli. Infection had therefore occurred through the blood route. It is undeniable that this experiment succeeded fully in demonstrating that an inoculation of the dental pulp may promptly entail a severe general tuberculosis. The local reaction was expressed in one case as a gingivitis and in the other as an alveolar abscess. The latter, had it occurred in the clinic in a human subject, could not have been distinguished from an ordinary alveolodental abscess. The author is to continue his line of experimental activity.

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EDITORIALS

What Is the Limit in Dental Education?

IN this day of rapid increase in prices, radical demands from labor unions, and decreased hours of production, after viewing the entire situation, one is forced to ask, "What is the limit to these things?" When confronted with all sorts of radical organizations, we are prone to overlook things within our own borders. We are inclined to believe that there is a radical element in medical and dental education that should receive attention, or it will run the professions on the rock of disaster as sure as the radical elements in this country will wreck the Government if they are not curbed.

There are certain members of the dental profession who have had more or less to do with education the last few years, and who have just as narrow a view of the relation of the profession to the public as does the most radical strike agitator have in regard to service and the public. The main object of the dental profession is service to the public, but some men seem to think that the

whole profession must be conducted according to their views and the public must accept things as the "chosen few" care to arrange conditions and standards. We refer particularly to some of the autocratic rules that are being advocated in regard to dental education, and believe that the limit of toleration on the part of the public has been reached.

Within a short space of time the requirements of dental education have passed through a series of changes that have been quite extreme compared to education in other lines. Medicine has been the only other profession that has seen such rapid changes, and while these things have been for the good of the professions in most part, they are fast approaching a point where, if carried any farther, the good of the public will be lost sight of and the professions will suffer as a result. The requirements for the education of the dentist and the practice of dentistry have reached a point where, if the general public were aware of the manner in which these dental laws are framed and administered for the benefit of the profession and not for the good of the public, the laws in many states would be changed.

We refer to the need of a National Examining Board for both the dental and medical profession. The great objection to such a law comes, not from the people, but from a certain group in the dental profession. It was only a short time ago that in most states any one could appear before the dental board, and if he showed sufficient knowledge, he would be given a license to practice dentistry. We do not know that the general public ever objected to that plan, but in all the cases of which we have any knowledge, that law was changed as a result of activity of the profession. Later, in all states, it became necessary for a man to have a D.D.S. degree before he could be examined by the state board. Then in some states the laws were again changed, by the activities of the profession, so that an applicant was compelled to have a certain preliminary training and must be a graduate from a certain type of college. Finally, in most states, the applicant must be a graduate from a school giving a four-year course. The majority of the state dental laws are supposed to be written "by the people," when, as a matter of fact, the people have very little to do with them.

If the radical change in dental education and the practice of dentistry does not reach a limit, the people will take things into their own hands, much to the sorrow of a few men and to the injury of the profession. Every change in dental education as now made has been and will be a greater burden to the public than it will be a benefit to the profession. Therefore, we are fast approaching the limit.

We have always favored improvement in the education of the dental student and such movements as we believed would improve the standing of the dental profession. However, there are some things which increase the cost of dental education that have a questionable value to the dental profession in regard to the service it will render the public. We have questioned the value of the four-year course from an economical standpoint, for in a great many schools, no more of dentistry is taught in four years than was taught in three. We were recently informed that in one school that has put in a five-year dental course, less time is devoted to crown and bridge work than when the course extended

over four years. It would also be of interest to know the relative hours of crown and bridge work in the three-year course as compared to the five. All of these things increase the cost of dentistry to the public without increasing the proportional value.

Reviewing the changes in dental education from another "end," we shall take up the time consumed in pre-dental education. We can remember when it was necessary for a student to have three years of high school work or its equivalent. Later the National Association of Dental Faculties made a ruling that each student should have completed four years of high school work. The object of this ruling was to improve the student body and it did make a great improvement in the men that entered dentistry. However, it had another effect which is reacting on the public, in that it decreased the number of men entering the profession much below the increase in population. The result is that there are fewer dentists today than there were before that law went into effect. We are aware of the fact that the public could not tell the National Association of Dental Faculties what to require, but again we must warn you of the fact that the public can say who shall practice dentistry. Whenever the "high standards" of dental education progress so far that the people cannot get the required number of dentists, the people will do something so that they can get dentists, and that will result in the change of dental laws so that the less qualified men can practice dentistry. Do we want that?

We believe that four years of high school and a four year dental course is as much time as should be required to educate a dentist so that he can serve the public. We are opposed to the five-year dental course on an economical basis and believe the extra year is not necessary and will only decrease the number of dentists and not increase the efficiency of those we do have enough to compensate. In fact, observation has proved that the highly specialized dentist is able to render service to fewer people than the man not so highly specialized.

There are a few men advocating a pre-dental year after the high school course. Some are even going so far as to ask that the dental student have a B.A. degree before he studies dentistry. Such things would undoubtedly improve the individual man, but it would not improve the value of the dental profession to the public. It will reduce the number of men entering the dental profession and produce an added cost of dentistry to the public and make dental service unavailable to a greater number.

Up to the present time the colleges and state boards have raised their educational requirements hand in hand. We know of instances where the state laws have been so changed as to meet the requirements of a certain school located in the state and only men from schools that had the same requirements would be allowed to take the state board examinations. While these things may have been done with a view of improving the standing of the profession, we doubt their value to the public.

Thus far the public has been given little consideration in the relative change of dental laws. However we believe that the time is fast approaching when the people will begin an investigation, as there are many communities that do not have dental service. With the increase in dental education, and the decrease in the number of dentists, we find the highly educated dentist going to the thickly

populated centers, and the rural districts and small cities are wondering why they cannot get dental care. If you tell them it is because the standards of dentistry have been raised, they will remember some old fellow who never had a college education but who rendered services that were satisfactory, and it will be a difficult task to convince them that the increased standards in dental education have been a good thing for them when they have been deprived of dental service entirely, as a result. When dental educators and state boards so control things that only men who have had five years of dental training and a pre-college year may practice, there will be danger of such a shortage of dentists that the people will take things into their own hands and the dental laws will be so changed that dentistry will be available as it was before.

Some may say that the state board would only pass high class men regardless of the dental laws, but we know of two instances where the dental board took an autocratic position with the result that for a time there was no board or dental law operative in those states.

We are in favor of efficient education, but we are not in favor of the five-year course or the pre-dental year in college as advocated by a certain number of schools. There must necessarily be a limit to the time and money spent on the education of a dentist, especially in those schools that are state institutions. The amount of money spent in the education of a dentist will be investigated by the taxpayers, and when they find they are paying too much for the education of a dental student in comparison to the value and availability of his services, something is going to happen. We know of a case where the medical department of a state university was spending too much money in comparison with the other departments, and the taxpayers investigated the matter. The result was not satisfactory to the medical department.

A pre-dental year given over to the study of subjects which have no direct bearing on dentistry will not add to the value of a dentist as a public benefactor. In fact, some of the subjects taught in a four-year high school course have little value in a dental education. The great question before the medical and dental professions today is the rendering of service to the public, and whenever the educational requirements are so arranged as to lose sight of that fact, the requirements become a detriment to the profession and the public. By the proper use of the time now required in dental education a real service can be rendered to the profession and to the public. The five-year dental course and the pre-dental year in college is the pet idea of a few men who have lost sight of the best interests of the profession and of the people.

ORTHODONTIC NEWS AND NOTES

The editors desire to make this department a permanent feature of the Journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

British Society for the Study of Orthodontics

An Ordinary Meeting of the Society was held at the rooms of the Medical Society of London, 11, Chandos Street, W., on Wednesday, January 14th, 1920, Mr. G. G. Campion, President, in the chair.

The minutes of the last meeting were read and confirmed.

Mr. G. V. McMahon was introduced to the members as a new member of the society.

The following candidates were elected: Walter Alexander Crane, Edward Pitt, and Arthur Thomas Pitts.

Notes of Interest

Dr. William W. Woodbury announces the resumption of his practice at 17 3/4 Spring Garden Road, Halifax, N. S. Orthodontia exclusively.

Dr. Leslie Merle Christie announces the removal of his office from 710 Fourteenth Street to the Burlington Hotel, 1120 Vermont Avenue, Washington, D. C. Orthodontia exclusively.

Dr. B. E. Lischer desires to announce the removal of his office to 4767 Westminster Place, St. Louis, Mo.

Dr. H. R. Faulkner announces that he will establish his office in the Greeley National Bank Building, Greeley, Colorado, about July first for the exclusive practice of orthodontia.

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ORIGINAL ARTICLES

A NEW TYPE OF MOLAR BAND AND LOCKING DEVICE FOR LINGUAL APPLIANCES*

BY JOS. E. JOHNSON, D.D.S., LOUISVILLE, KY.

FOR an orthodontic appliance to be a success, it must have secure anchorage; this anchorage is usually obtained by fastening appliances to molar teeth by means of bands on these teeth.

The most successful bands in the past have been the Angle and the Luken type bands; the objections to these bands are mentioned by Dr. Hawley in a paper he read before the American Society of Orthodontists in Pittsburgh in 1915, which are as follows:

(1) The Angle band has the bolt and nut on the lingual surface which is used to draw the band together; this is irritating to the tongue and by its size and unevenness causes the formation of pockets for the lodgments of food and debris between tooth band and adjacent tooth.

(2) The attachment of the bolt and short tubes to the band is weak and often gives way under stress.

(3) The free edge of the band turns back under the impact of mastication. If the bolt and tube are placed at the gingival edge so as to draw the band tight at the margin, this danger is increased.

(4) The uncovered portion of the tooth on the lingual surface is a source of danger and weakness and if the band is so made that the edge laps it is thick and clumsy.

(5) It also prevents the use of a verticle tube on lingual surface a most valuable form of attachment of the lingual arch.

I wish to add another objection which I think is the worst of all, namely, after a band has been on the tooth for some time the bolt on the lingual loosens

*Read before the Alumni Society of the Dewey School of Orthodontia, Chicago, Ill., April 1-3, 1920

slightly, which permits the cement to wash out. The band is still tight enough not to be noticed and when it is finally discovered you have a discolored or decayed tooth.

The form of clamp band that has a bolt on the buccal surface has several objections:

(1) If the band is fitted to the tooth in the best position the direction of the tube is often not correct and cannot be quickly and safely changed.

(2) No other attachment than the hollow bolt can be made on the buccal surface.

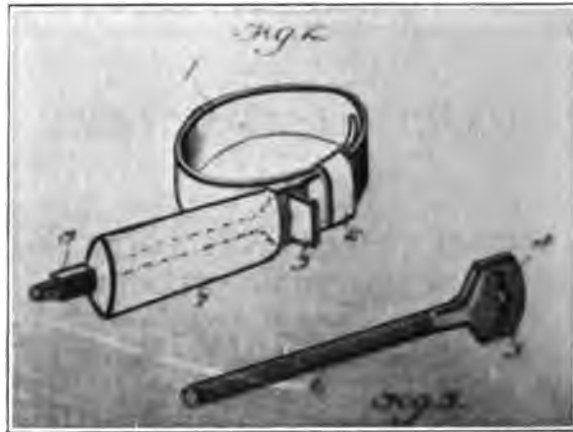


Fig. 1.



Fig. 2.

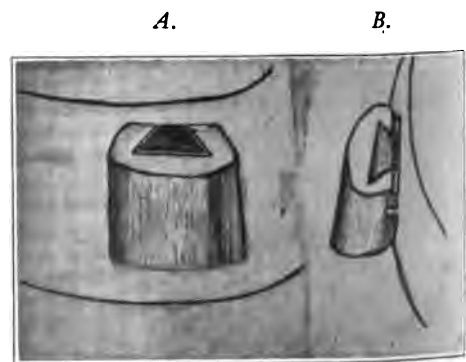


Fig. 3.

(3) The loosening of the bolt, permitting the cement to wash out and the consequent decay is also true of the Luken type band.

These many objections to clamp bands have caused a great many orthodontists to discontinue their use and to make plain bands for the molars.

The plain band can be fitted in the mouth or on a plaster model. The former is the quicker, but painful to the patient and it is also very difficult to pinch a band around a molar tooth in the mouth and have it fit accurately.

The making of bands on plaster models is more satisfactory, but this takes quite a bit of time and a good deal of experience to get the technic down, so that one can judge just how much to trim the plaster model at the gingival to have it fit the tooth accurately.

After trying both methods of making plain bands, which were unsuccessful in my hands, I came to the conclusion that if I could find a way to draw the band around the tooth by the means of a jackscrew and then remove it and solder the band, I would have a perfect fitting band. After some experiment I worked out the following band and jackscrew.

Fig. 1. The band consists of a strip of metal with a staple soldered at a half inch from one end. The other end of the band is trimmed so it will pass through this staple. This end is then passed through the slot in the jackscrew and bent down so it will not slip out. The nut is then tightened up until the sleeve of



Fig. 4.

jackscrew rests against the staple on the band and the band is drawn up until it is approximately the size of the tooth to be banded. It is then slipped on the tooth with a jackscrew on the buccal side.

Fig. 2. With an orthodontic wrench the jackscrew is tightened until the band fits the tooth.

Your experience gained with clamp bands will tell you when you have the band tight on the tooth. I then burnish the band roughly to the tooth. With a sharp instrument I then mark the band at the staple, loosen the jackscrew and remove the band.

I now solder the band where it overlaps and unsolder the staple; this gives me a plain band which fits the tooth accurately, to which any attachment can be soldered buccally or lingually.

The lingual lock, Fig. 3-A, consists of a half-round bar soldered to the band, over this slips a clasp of clasp of gold; there is a square pin hole through the clasp

and bar near the occlusal Fig. 3-B. The pin is passed through the hole and drawn over the occlusal surface of the clasp and burnished into the groove, so that the force of mastication will not dislodge it.

This type of lock does not interfere with occlusion. Any form of lingual appliance can be soldered to it; there is practically no play, which is very essential to any form of lingual appliance.

Fig. 4 shows the instrument used for adjustment of lock.

Figs. 5, 6, and 7 show some appliances used with lingual lock.



Fig. 5.



Fig. 6.



Fig. 7.

DISCUSSION

Dr. Max E. Ernst, St. Paul, Minn.—This paper is somewhat difficult for me to discuss. Dr. Johnson has shown some fine technic in the making of these appliances and it seems that the attachment is going to be a very valuable one. Not being much of a technician, I do not feel competent to discuss this appliance from a technical standpoint. However, I should advise you all to see Dr. Johnson's clinic, since you will learn more from his clinic than from his paper.

Having used no clamp bands in my practice, I can say very little about them. I should not think that they were indicated when using lingual arches, I thought that I could get a band by pinching it and contouring it that would fit as accurately as the bands that Dr. Johnston makes, but after seeing some of the bands in his clinic I am not so sure that I can do so.

Dr. Johnson's locking device interests me very much. With this device he gets an attachment which is almost as secure as a soldered attachment. In my work I have used

the half-round wire and tube as suggested by Dr. Mershon. There is always a slight play in this form of lock and I think that one of the strong points in this new lock is its stability. Another advantage it possesses is that a longer tube can be used in the lock because there is no arch wire above and lock wire below it.

This appliance may be slightly more bulky than that advocated by Dr. Mershon, but it looks like a very efficient one and I want to compliment Dr. Johnson on his fine technic.

Dr. Martin Dewey, Chicago, Ill.—In connection with my remarks I should like to show three slides I have picked out. One of the nicest things about this band technic Dr. Johnson has shown is the fact that you can make everything yourselves. The jackscrew can be constructed and a slide can be made.

So far as the mechanics of the thing is concerned, it makes a beautiful band, but the only objection I have to it is that the band is so thick. It probably does not make any difference in using a thick band; you can change the contour and fit it to the tooth itself. There is enough bulk and strength so that it stays there. With the thick band Dr. Johnson uses you could not make a band without the device. With band material of 34 or 36 gauge iridio-platinum, I can make a band without the clamp as Dr. Johnson does, although he tells me I cannot. It is not a question of time. He can make a band as quickly as I can without the device. It works satisfactorily, and the principal thing is to make the band so that it fits accurately. There is no question about the efficiency of it, and it pleases me very much because it is something you do not have to buy. He has given us a good technic without tying a string to it. The only unfortunate thing is you have to buy pins from a supply company. The dental supply companies make me as nervous as the dental hygienist. (Laughter.) These things can all be made. Instead of putting the attachments on the market and charging royalty and having them in the hands of some dental supply company, Dr. Johnson gives you the entire plan. You can buy this wire in foot lengths from any concern.

There is one thing which the essayist did not mention which he showed us in his room. As you cast the lock it contracts. He fits this wire so tight that you cannot get it out without forcing it. He forces this thing into the locking device. It fits accurately and is made so thick that it is strong enough to stay tight. Then the plan is to drill a hole through the seat for filling the notch through the wire, and that is set, and the soldered band makes a hole and you get a locking device. There is no danger of breaking this loose. The lock stays locked. As Dr. Ernst says, you get away from the thickness of the lingual wire on top of the tube, and the thickness of the locking device below the occluso-gingival angle. It makes by far a better locking device for a lingual appliance than anything I have ever seen, and it is something you can make.

I do not know whether you know it or not, but in the United States Patent Office there are several patents on locking devices for lingual appliances and buccal appliances. The patents have been taken out by members of the American Society of Orthodontists. Some of these patents have been taken out under names that people would hardly recognize. I have copies of these patents. This device is very effective, and the whole thing, with the exception of the locking pin, can be made by yourselves and with the ordinary wire used as a lock you avoid paying royalty to any one.

Dr. George B. Crozat, New Orleans, Louisiana.—In the first place, I feel that I must congratulate Dr. Johnson upon the results he has obtained. I am sure his appliance is more efficient than the one I am using which is similar, though removable. Dr. Johnson and I three years ago in Louisville discussed the matter of appliances, and at that time I explained to him the appliance which I use. A great many men differ relative to appliances as to whether they should be fixed or removable. I must say in my hands removable appliances have been rather satisfactory, though I do not use them altogether, I do to a large extent. There are many difficulties that arise in the use of removable appliances, for example, in having patients wear the appliances and of having them become loose or broken. If I do not get results with removable appliances for some case, one of two things must be wrong, the patient or the appliance, and advise the patient to discontinue their use. In these cases, it is my future intention to use Dr. Johnson's lock and appliance where they do not progress when using removable ones.

Dr. Johnson has gone further and has developed a locking device which is ideal. In constructing appliances, he embodies the principles of the appliances of Jackson soldered to his locks. Dr. Dewey criticized one point in Dr. Johnson's appliance, and that was the thickness of the banding material, and he has repeated it here. I think the criticism of the thickness of the band is well taken. If you use iridio-platinum you have a banding material tough enough or of sufficient tensile strength to resist the stress of mastication. Dr. Johnson does not use iridio-platinum. He uses, I think, 31 gauge Blue Island Brand banding material, and this banding material must be of sufficient thickness to resist the stress of mastication, and of that gauge it does it admirably. For such a rigid locking device as Dr. Johnson has developed, it is necessary to have equally as rigid a band; because when locking the lock, if the band is not rigid enough, it may be removed or loosened, and the effectiveness of the lock destroyed. Both lock and band must be rigid to be effective. For that reason, I think, it is an advantage and not a disadvantage to have a thick band.

Dr. F. C. Rodgers, St. Louis, Missouri.—I wish to compliment Dr. Johnson on his attitude toward the profession in giving us this appliance, with no string attached to it, as Dr. Dewey has said. It is the missing link in our lingual arches and locking device.

I wish to refer to a locking device I have seen which may perhaps solve the problem of buying pins which are part of a patented article. By drilling another hole, another slot in this device and inserting a double pin you will avoid the necessity of turning the distal end of the pin and bringing it over on the occlusal portion. A double pin, if properly aligned, will slip into the two slots and remain in there, and you can remove that with a hooked instrument and destroy it. Being round, it will slide into place and any discrepancy will be compensated for. That may be suggested as an improvement.

I would like to have Dr. Johnson tell us what technic he employs in soldering the locking device to the band so as to avoid flowing solder into that tube and taking care of that by drilling a hole in a certain place.

I think what Dr. Johnson has given is a wonderful addition to our technic, and I cannot express in words sufficiently adequate my deep appreciation of it.

Dr. Sydney W. Bradley, Ottawa, Ontario, Canada.—I first used the clamp band, but during the past year I have been using a plain band made of Weinstein metal Nos. 2 and 3. Some of this is .006 inch thick and some .005 inch thick. When I was in general practice I sometimes used the Twentieth Century steel tooth forms which were condemned and praised by members of our profession. I got in the way of using them for shaping my clamp bands before fitting them in the mouth, and now that I use the plain band made of stiff metal I still find them useful. After my separation, I measure the tooth to be banded with a piece of fine wire, and then get a steel tooth form which is just a trifle smaller than the wire measurement. I fit the strip of banding, cut the proper length, over the steel die, draw it together, using a pinch joint and then fit it in the mouth. You can fit it very easily in the mouth by using the Howe or Angle band-forming pliers. Dr. Johnson's method of soldering with the overlap is much neater than the pinched joint, but the latter can be trimmed and finished to be a neat joint too.

Dr. Lowrie J. Porter, New York City.—I would like to ask Dr. Johnson whether he has had any trouble with his appliance when used on the lower teeth. In using the Mershon removable arch, even where there is quite a little play, I have had some trouble in placing it in the tubes on the lower teeth of children with narrow arches and often fairly large tongues. I have found with the Mershon appliances that the more accurately they fit in the tubes, the more trouble was experienced in adjusting, and I wonder whether, with this lock, there will not be still more trouble in getting them in place.

Dr. John A. McPhail, Blanchester, Ohio.—I would like to ask Dr. Johnson if he has any way of paralleling these tubes? Do they fit accurately? How can you get the teeth in without paralleling them? Does he depend upon his eye?

A Member.—I would like to ask whether this appliance is applicable for fastening the labial arch to the band, and whether there would be any objection to that.

Dr. Johnson (closing).—There is no particular advantage in using the "Angle" lock pin. The reason I use it, is that they are already made up and accurately fit the pin hole that I saw into the lock.

If you wish to make your own pins, take a medium-sized ligature wire; say about a 26 or 27, run it through a gold rolling machine to flatten it out, dip the end in borax, hold over a blow pipe and you will get a nice head on your pin. These pins are really better than the "Angle" lock pins, for they have a better head on them.

Dr. Rogers asks how I solder the half round bar to band without getting solder in pin hole. There is not much danger in the solder running into the pin hole. I flow the solder on the band and then hold half round bar on band with pair of soldering pliers; as soon as the solder flows, remove from flame. In case solder flows into the pin hole, it is very simple to remove the half-round bar and re-solder a new one. Don't try to drill solder out of the pin hole because the pin will not fit accurately.

In reply to Dr. McPhail, I use my eye in paralleling the locks. It does not make any difference whether the locks are not exactly parallel, for there is enough spring in the appliance to let them go into position without trouble.

INDICATIONS AND CONTRAINDICATIONS FOR THE EXTRACTION OF TEETH FOR THE PURPOSE OF CORRECTING MALOCCLUSION*

BY MARTIN DEWEY, D.D.S., M.D.

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THE question of extraction for the correction of malocclusion has always been a point of conflict between various men in the practice of orthodontia. According to the title of this paper we are willing to admit that there are indications and contraindications for the extraction of teeth, and will endeavor to give you a few examples which will, to a certain extent, tend to illustrate what we mean by the above title.

We can say that the contraindications for extraction greatly outnumber the indications of extraction for the correction of malocclusion. Various types of malocclusion have been described as indicating and demanding extraction and in some instances the reason for these extractions have been based upon the diagnosis of the case as described by the writer. Therefore some of the disputed questions in regard to extraction have been waged around the diagnostic point in regard to the type of malocclusion that is present and in some instances writers who have advocated extraction and nonextraction have not been as far apart as at first we imagined. The old argument that extraction should never be resorted to in any case may be considered as being too broad a statement, because there are certain etiologic and pathologic factors present in some types of malocclusion in which a more serviceable result can be rendered to the patient by the extraction of one or more teeth. The question of extraction, however, in these cases is decided upon etiologic and pathologic factors, the age of the patient, the condition of the tissue surrounding the teeth, which means that other factors must be considered than the mere "class of malocclusion" as you recognize it according to the classification of the mesio-distal relation of the arches as adopted by this society.

Probably the two greatest advocates for the extraction and correction of malocclusion today, judging from their writing, are Dr. Calvin C. Case of Chicago, and Edward Canning of Denver, Colorado. It is my belief that the majority of the cases which these two writers cite in their text books as indicating extraction are cases in which extraction is contraindicated. In Chapter 14 of Dr. Case's *Principles of Dental Orthopedia*, published in 1908, he reviews the *Symposium on Extraction of Teeth*, which was held by the Second District Dental Society of the State of New York in February, 1905, and also refers to a paper by himself published in the *Dental Cosmos* for April and May, 1906. In this chapter he particularly calls attention to cases characterized by protrusion of the upper or retrusion of the lower teeth as demanding or not demanding the extraction of the teeth. He shows cases of "retrusion of the lower with slight protrusion of

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the upper" in which he states extraction is not demanded. The other cases which he characterizes as "protrusion of the upper with lower normal" and "protrusion of the upper with retrusion of the lower" and also "upper protrusion with retrusion of the lower jaw and teeth" are cases in which he desires extraction. In this chapter, he states that he has selected six typical cases which demand correction without extraction and twelve which demand extraction of the first or second premolars for their perfect correction, and "it is about in that proportion in this character of occlusion that the two methods of treatment, nonextraction and extraction are respectively demanded." All of these cases to which he has referred are cases which the majority of this society would classify as distocclusion, or cases where the lower arch has a posterior relation to the upper. In the majority of these, Dr. Case contends, as does Dr. Canning, that the upper arch is the one that is at fault and we have protrusion of the upper with normal lower or only a relative degree of posterior relation to the lower arch. So in the beginning it is impossible for the writer to agree with Drs. Case and Canning upon the diagnosis of these conditions and will state that all of these cases which Dr. Case describes in Chapter 14 of which he says six should be treated without extraction and twelve with extraction I will say that extraction is contraindicated in all of these cases. As a result of this, I will further state that there is no type of malocclusion based upon anterior or posterior or mesio-distal arch relations in which one can say that extraction is demanded in all of a certain group. There are undoubtedly a few cases of mesiocclusion in which the length of treatment can be shortened to a great extent by the extraction of one or more premolars. Mesiocclusion cases in which we find a decided bunching of the lower incisors, or cases with labioversion of the lower teeth in relation to the upper in which it is the intention to retract the six anterior mandibular teeth bodily, may be advantageously treated by extracting a mandibular premolar. However, this class of cases is extremely rare, and in my practice has never been encountered.

Another condition which has been mentioned by Dr. Case and Dr. Canning is what is termed, "bimaxillary protrusion" in which they contend the teeth in both the maxillary and mandibular arch have taken an anterior position in respect to the face. I am willing to admit that if such a case ever existed extraction of the four premolars would be justified, but in my practice I have never seen it. Dr. Case has described these conditions for a number of years, and I sincerely hoped that when I came to Chicago, I would be fortunate enough to find such a case, as I was never able to find one in communities where I practiced heretofore. I am willing to admit, for the sake of argument, that if bimaxillary protrusion existed, extraction would be justified, but I have never seen the case.

Another type of cases in which extraction is indicated is in mesiocclusion cases with impacted lower third molars. In some mesiocclusion cases it may be advisable to extract the second molars and allow the third to take the position of the second, but nevertheless this is a pathologic condition which makes extraction necessary, and the extraction is not performed because it is a mesiocclusion case.

We find extraction of third molars indicated in neutroclusion cases where an eruption of the third molar is producing a bunching of the anterior teeth. Also in those cases where the third molar has become impacted and is producing an elongation of the second molar with the result that the bite is being opened.

Therefore in the treatment of malocclusion extraction of the third molar is indicated (1) in neutroclusion cases where the eruption is producing bunching in the incisors, or (2) supversion in the molar region which is producing an open bite in the incisors. We also find another type of neutroclusion condition in which there is a supversion of the first permanent molars produced by the eruption of the second molars that has resulted in an open bite condition and the lengthening of the face from the nose to the chin, in which case also extraction of the first molars is indicated for the purpose of closing the bite and producing a proper length of the face.

Another pathologic factor which will have an influence on extraction is that of devitalized and diseased teeth. If a patient presents himself to us for treatment with one or more teeth badly diseased, and in the light of modern knowledge we know the tooth can be retained but a short time without being a detriment to the patient, then the extraction of that diseased tooth is indicated and a compromised treatment should be followed which has been suggested by various members of this society during the last few years.

Another indication for extraction is found in mutilated cases where a tooth has been taken out of one arch and the case is treated with the idea of a compromise treatment to produce harmony in the size of the two arches by extracting the corresponding tooth in the opposite arch and allowing or causing the space to close. While these compromised treatments will not produce normal occlusion, it is the belief of the writer that they will shorten the time of treatment and render the patient a more effective dental apparatus than would be obtained if the spaces had been maintained and artificial teeth substituted.

Extraction may also be indicated in conjunction with missing teeth and the treatment based upon the same lines as suggested in those cases where we have mutilated arches or have been forced to extract because of pathologic involvements of the diseased teeth. However, in those cases in which missing teeth are present, it must be remembered that you have the two types of compromised treatment, that is first, endeavoring to close the space in one arch and leaving the normal number of teeth in the opposing arch, or second the extraction of one tooth in the normal arch so as to make the same number of teeth present in both lateral halves. In supernumerary teeth, the extraction of the supernumerary tooth is the general procedure, but in some instances we find the supernumerary tooth has assumed a much better position than the normal tooth and the supernumerary had also such a good shape that the length of treatment may be shortened by extracting the normal tooth and leaving the supernumerary in position. Another condition which has a bearing upon the indication for extraction is the age of the patient. The patient receives orthodontic treatment with the idea of improving the malocclusion, so as to render them a more efficient masticating apparatus, or to correct facial deformities. We find in older patients that the condition of the supporting structures are such that an extensive movement of malposed teeth is not indicated and then extraction may be resorted to, as the most feasible manner to give them an improved malocclusion, and also shorten the time of treatment. The age of the patient, the condition of the tissue and the length of treatment are factors which may decide in favor of extraction in any of the three classes of arch relation, for the purpose of producing a compromised treatment of that individual, which will be efficient. In those cases

we work for the purpose of improving the masticating efficiency of the teeth as being the more important than the ideal results, the obtaining of which is questionable, owing to the condition of the patient and other factors we have mentioned.

We find the age of the patient will also be a contributing factor in regard to the type of treatment indicated, especially in those cases where the loss of the upper or lower deciduous molars has allowed a drifting forward of the permanent molar so as to produce an abnormal locking of the molar region in one or both sides. Where the upper molar has drifted forward, these cases have erroneously been classified as unilateral distoclusion but according to the proper classification as suggested by Lischer they should be classified as "neutroclusion with mesioversion of the upper molar." Cases of the age of seven or eight should be treated by moving the upper molar back to its normal anterior posterior relation, developing the arches, so as to allow all the permanent teeth to assume their position, thereby establishing a normal occlusion of all the teeth. Cases more advanced in age, after all of the permanent molars have erupted, and all of them have taken an anterior relation to the lower molars, offer treatment by extraction. The upper canine and first premolar occupy the normal mesio-distal relation to the lower, therefore such a case is one of neutroclusion with mesio-version of the molars.

The second premolar is always impacted and if removed greatly shortens the time of treatment and gives the patient a serviceable masticating apparatus. These cases offer two plans of treatment: First, that of moving back or posteriorly the three permanent molars which would be a long procedure. The second and much shorter plan, and I believe the most wise plan, from the standpoint of time and efficiency, would be the extraction of the impacted premolar, leaving the maxillary molars to occupy their mesial position.

The question of the age of the patient and not the type of malocclusion would be the deciding factor between these two plans. Also in all cases of extraction in the treatment of malocclusion etiologic factors are the greatest deciding point, and not the type of malocclusion.

DISCUSSION

Dr. Varney E. Barnes, Cleveland, Ohio.—The setting up of rules indicating and contra-indicating extractions for the purpose of correcting malocclusions, is a very dangerous procedure, particularly as a means of teaching young or old students of orthodontia.

Accentuating what Dr. Pullen has remarked, there cannot be extraction for the purpose of correcting malocclusions, except in cases of supernumerary or very deformed teeth that interfere with the placement of other teeth. Barring these exceptions, the extraction of the teeth is a compromise treatment of a deformity, not a method of correction.

The essayist's rules and suggestions for extraction are in the main to be condemned, since he has not shown full x-rays indicating (1) soundness of all teeth; (2) the proper placement of roots of adjacent teeth and (3) presence or absence of all teeth. Every time a tooth is extracted, whatever the necessity, the operator should be on the defensive. He should consider the effects of extraction from all angles possible at the time, and his defense, to be free from just criticism, should be well nigh perfect.

The advising of extraction in many of the cases illustrated seems like snap instead of sound judgment. In most or all cases it should seem advisable to first try the teeth under orthodontic stress to determine something of the possibilities in each particular case. Then, if undue resistance is met, extraction might prove a lesser evil, not a correction.

THE RELATIONSHIP OF FORM TO POSITION IN TEETH AND ITS BEARING ON OCCLUSION

(Continued from page 490.)

BY MILO HELLMAN, D.D.S., NEW YORK CITY

THE GIBRALTAR SKULL

THE *Gibraltar skull* is thought to be that of a female. It was discovered in 1848 at Gibraltar. This was the first member of that race discovered in Europe. The restorations were also made by Prof. MacGregor. This as well as the other cast, is on exhibition at the American Museum of Natural History in New York City.

In the Gibraltar skull, the original fossil remains, the alveolar arch is quite well retained. The restorations made (Fig. 23) were limited to the incisors and



Fig. 23.—Dentition of the Gibraltar Skull. Occlusal view, showing restorations by Prof. McGregor of incisor and molar teeth.

the molars. But owing to the existing alveolar process and the remaining teeth the task of making a correct restoration was not extremely difficult though it entailed great care as to the accuracy of the prevailing primitive conditions. Thus, the molars are rhomboid in form and are set in a primitive position as regards their antero-posterior axis. The form of the premolar can not be described because they have not been thoroughly freed from the mineral deposits which as may be seen, obliterates their contour. Their position, as that of the premolars

in the Heidelberg lower dental arch is in alignment with the flat oval curve extending from the anterior (or mesial) surface of the first molar of one side to that of the homologous molar on the other side. The first premolar is, therefore, considerably more lingual than the second in the Gibraltar skull and more so than it is in later races of modern man. The canines, again, instead of constituting the terminals of the incisor arch which is rather flat or shallow, are



A.



B.

Fig. 24.—Dentition of *Homo Mousteriensis*. A.—Front view, showing edge-to-edge bite. B.—Right side view, showing occlusion close to normal.

included in it. The form of the entire upper dental arch is such as to come quite near the pyriform arch of the Orang.*

Two contemporary races made their appearance in Europe during the latter part of the Pleistocene (Glacial) epoch. One was the Mousterian, a Neanderthaloid race, the other the Aurignacian who according to some authorities is the forerunner of modern man.



Fig. 24-C.—Left side, showing similar conditions as *B*, the teeth being prevented from coming into apposition by warping in the condyle region of the lower jaw.



Fig. 24-D, E.—Occlusal view of upper *D*, and lower *E*, showing the difference in position of upper and lower canines and molars. (J. Leon Williams' collection, Am. Mus. of Nat. Hist.)

*See "Observations on the Form of the Dental Arch in the Orang," *Internat. Jour. Orthodontia*, February, 1918, IV, No. 2.

The remains of *Homo Mousteriensis* include a fairly complete skull with almost perfect dental arches. It is the skull of a youth (Fig. 24, A, B, C, D, E), with considerably large teeth. The upper central incisor, for instance, being 11 mm. mesio-distally and 8 mm. labio-lingually; the upper first molar 11.7 mm. by 12 mm. In form, the teeth, with the exception of the lower second premolar and upper third molar do not vary to any great extent from those of modern man, though in size they differ considerably.

The lower second premolar is considerably molariform possessing four cusps, the disto-lingual cusp of the modern tricuspid tooth is divided into two. The lower molars all have the hypoconulid and are therefore five cusped, the paraconid being lost, they are all of equal size. The upper third molars possess a decided hypocone as do the first and second molars in addition to which the first also has a hypoconule. It may also be stated that the upper incisors are rather flat labio-lingually as compared with their mesio-distal diameter at the



Fig. 25.—Lower jaw of Neanderthaloid individual. Occlusal view, showing primitive position of canines and conformation of lower arch. (Am. Mus. of Nat. Hist.)

incisal edge. The position of the incisors as well as the inclination of the alveolar process in that region, is rather orthognathous, approaching more modern man than that of the *Neolithic*. Their occlusion is that of a very slight overbite relation, as may be observed by the facettes on the upper central incisors.

The canines, while resembling those in modern man completely in form and position in the upper jaw, remain primitive in position in the lower jaw (See Fig. 24-D and E). The labio-lingual axis in the lower is directed more antero-posteriorly than in the Aurignacian or Modern Man. The left canine is still the deciduous member. Another point of interest may be seen in the left impacted permanent canine, Fig. 24, A.

The premolars are bicuspid in the upper and bicuspid (the first) and quadricuspid (second) in the lower. Their occlusion, of course, is of the interlocking type.

The molars in the upper jaw are rhomboid in form, rounded in contour, and retain the primitive trigone and hypocone. In the lower series, they are of the

Dryopithecus modification of the tuberculo-sectorial type of molar, having lost the paraconid though retaining the hypoconulid. In position, the upper exhibit their primitive character while in the lower the buccal cusps are more evenly aligned. The occlusion is of the primitive type, i.e., the protocone fitting into the talonid fossa and the hypocone into that of the trigonid. Owing, however, to a slight warping in the condyle region which probably occurred in the process of fossilization, the lower jaw can not be accurately adjusted in occlusion (see Fig. 24, B, C).

Another point of interest in conjunction with this specimen is attached to the difference in form of the upper dental arch as compared with that of the lower. On reflection it may be recalled that in the anthropoids, such association appears in a large number of cases. Owing to the difference in the character and nature of the teeth in the two jaws, it must be quite obvious that there should be a difference in the form of the arch to conform to the difference in



Fig. 26.—Dentition of a *Neolithic* young individual, showing form and position of upper left lateral incisor. (Am. Mus. of Nat. Hist.)

position of the canines and the deflection into opposite directions of the antero-posterior axis of the molars in the two jaws.

Another specimen (Fig. 25) of the same race, of a considerably older individual as indicated by worn surface of all the teeth, shows the same relative position of the canines on both sides and the form of the lower dental arch, in the incisor, canine and premolar region. Judging by the facettes on the incisors and canines one may be led to the conclusion that these teeth were in edge-to-edge relation.

Fig. 26 represents the entire lower and one half of the upper jaw of a very young individual of Neolithic time, as may be seen by the presence of some deciduous molars, the absence of the upper canine and the erupting lower canines and first premolars. The point of greatest interest connected with this specimen is the form and position of the upper lateral incisors. This is the oldest representative of man known to me to possess this form of lateral incisors and occupying the lapping position indicated. As will be seen later, this characteristic position may be due to morphogenetic conditions and is prevalent in many races in modern man.

THE DECIDUOUS TEETH OF MODERN MAN

Before taking up the dentition of modern man, it will be profitable to pause for a moment and consider several features associated with the human deciduous teeth. Although exhibiting generalized characters, the deciduous teeth of man form another link in the chain of evidence establishing the bond between lower animals and *Homo Sapiens*. Thus, there are several features in the human deciduous dentition that present primitive characters that closely resemble similar manifestations in the homologous series of the ape. In the deciduous teeth of man, the following points are of interest:

1. The incisors closely resemble those of the Gibbon in size, form and position. The only exception is the lack of the accentuated palatal cingulum in the upper incisors in man. In both ape and man they are vertical in position and meet in an edge-to-edge or overbite occlusion. The occlusion of the incisors is significant in relation to the development of their permanent successors and the antero-posterior relationship of the jaws. In order not to disturb the antero-posterior relationship of the two jaws, during the period of development of the permanent incisors, two manifestations become evident. The deciduous incisors become spaced considerably if they are in an over-bite relationship, or they remain less spaced if they assume the edge-to-edge occlusion. If neither of these conditions is fulfilled, due to disturbances not encompassed within the scope of this paper, there will result one of the various anomalies in occlusion of the permanent teeth. Thus, there may ensue:

- a. A change in the antero-posterior relation of the two jaws, with or without complications in the antemolar region, or,

- b. No change in the antero-posterior relation of the jaws will occur but complications may arise in the antemolar region.

Furthermore, the lack of spacing in the incisor region is only diagnostic of certain morphogenetic processes that become manifest in the permanent dental series. Thus, the permanent upper lateral incisors during their development before eruption, occupy one of two positions. Either they lap the distal end of the crowns of the central incisor with their mesial crown portion or *vica versa* they are lapped over their mesial portion by that of the distal of the central incisors. In either case there are certain features brought about in the position of the lateral incisor that reveal this condition when they subsequently take their position in the dental arch.

2. The canines are globular in contour and resemble the incisors of several species of Carnivora though being larger in form. The occlusion, simulating that of the incisors, is either in edge-to-edge or over-bite relation.

3. The molars differ in form and position in the two jaws and from one another in each jaw. Thus, the upper first molar, though being bicuspid in form, presents such sharp mesial and distal marginal ridges in connection with the cusps as to render the form of the cusps more like those of the permanent canines with cutting edges the buccal cusps being separated from the lingual by a deep and angular groove. In some instance there is a vestigial metacone present. The lower first molar on the other hand exhibits decided primitive features. It is tuberculo-sectorial in character, exhibiting a vestige of the protoconid-

paraconid shear; in the structure represented by the mesial marginal ridge; the buccal slope with the exaggerated gingival swelling resembles that of the first premolar in the anthropoids against which the large upper canine exerts its greatest functional activity. The metaconid is more distally placed than in the second molar or than in all of the permanent molars and resembles that of the anthropoids. The posterior moiety shows the talonid with its basin-like depression for the accommodation of the lingual cusp of the upper bicuspidate first molar. The other cusps on the talonid are the hypoconid, entoconid and a vestigial hypoconulid. In position this tooth resembles the sectorial, being obliquely set with the mesial surface antero-internally.

The second molars both upper and lower exactly resemble the first permanent molars in form, though being smaller in size, and their occlusal surfaces are more constricted as compared with those of the permanent teeth. The ridges and grooves are not as well defined and the enamel is more irregularly deposited than in the permanent teeth. The upper second molars retain the primitive trigon to which the hypocone is added. The lower as in the apes has lost the paraconid but retains all the other primitive cusps. The occlusion is of the primitive type, the protocone fitting into the talonid basin. Owing, however, to a slight rotation of the upper second deciduous molar appearing in a large number of cases in modern races, the primitive position of this tooth, involving its everted mesio-distal axis, seems to be changed and the molars are described as occluding cusp-to-cusp. If the palatal cusps, however, be examined, it will be found that the primitive relationship is maintained despite the buccal manifestation.

6. ON THE FORM, POSITION AND OCCLUSION OF TEETH OF MODERN MAN

In the lapse of time from Heidelberg man until now (about 250,000 years), there has been a considerable increase in number of individuals constituting the human family. The records, therefore, of modern man must necessarily embrace vast numbers of specimens. To approach anything like a complete study of modern man, presents, consequently, a problem of enormous proportions. Since it would be out of the question for one in the practice to devote sufficient time for such an undertaking, it is necessary to limit such desires in accordance with the odd moments available for study.

The material examined was obtained at the American Museum of Natural History of New York, and at the U. S. National Museum at Washington, D. C. It comprises the skulls of American Indians, Mongolians, Eskimos, Natives of Asiatic South India and some European Whites in the following proportion:

American Indians	.....U. S. Mus....649 }	..... 3368
	Amer. " ..2719 }	
Mongolians	.....U. S. Mus.....	207
Eskimos	.....U. S. Mus....173 }	..... 187
	Amer. "14 }	
European White (Spain)	Amer. Mus.	6
Asia, So. India	.....Amer. Mus.	8
In all	.....	3776

From the quantity of this material only those skulls presenting the best and most complete dentures in what is understood as "Normal" or nearest to "Normal" in occlusion were selected for careful examination and study.

The primitive characters observed in connection with the form, position, and occlusion of the teeth in the other groups of animals are also manifested in those of modern man. Moreover, these characters are *fundamental* and may be interpreted as being of evolutionary significance and exhibiting racial peculiarities.

It is, therefore, necessary to treat this portion of our topic from the aspect of first, the general features *common* to all the dentitions examined, and second, those of *divergent* peculiarities.



Fig. 27.—Casts of Dentition of modern white female. A.—Anterior view, showing position of convex lateral incisors and normal overbite. B, C.—Right and left sides, showing normal occlusion of pre-molar-molar series, convex laterals lapping the distal portion of the central incisor.

THE ASPECT OF THE GENERAL FEATURES COMMON TO THE DENTITIONS EXAMINED

Under this heading the form and position of all the teeth in modern man may be included. The incisors, for instance, having acquired the human form with which you are all well acquainted, vary little in general. In contour, they may vary in different races and in certain individuals of the same race. Thus, the mesio-distal labial aspect of the crown in the upper incisors may appear as a flat surface in one instance, as in many Indians, and Eskimos and in others they may be decidedly convex. The lingual surface on the other hand may vary from a simple plane to a decided concavity. This form is found to be associated with the horizontal position of those teeth. Thus, the flat centrals in the Indian

are found usually everted at the distal angle, while the extreme convex laterals are found lapping the centrals in other races as in the neolithic. In their long axis the incisors may present a straight line from root apex to crown edge, or a considerable curve approaching somewhat that in the orang incisors; or, they may present a double curve, concave labially in the root region and convex in the crown. In position they are all vertical, though varying in degree of inclination in different races and in the individuals of each race. In occlusion they are either in an edge-to-edge or an overbite relation.

The proportionate difference in dimension between the upper centrals and laterals is not as marked in Man as in the anthropoids. Though the lateral incisors vary considerably in form and position, they may be identified by two



A.

Fig. 28.—Dentition of Eskimo. A.—Front view, showing flat type of incisors in edge-to-edge occlusion.

distinctive manifestations. In the one, the labial surface is considerably convex mesio-distally, quite narrow at the neck, and its incisal edge is very much pointed at the mesio-incisal angle; while the distal incisal angle is very obtuse, presenting an aspect as though the entire crown is curved with the concavity on the mesial. The position of a lateral incisor of this description is invariably such as to permit the mesio-lingual angle to lap the disto-labial of the central incisor (Fig. 27, A, B, C).

In the other instances, the lateral incisor presents a flat labial and lingual surface. Very often a vertical shallow groove may be seen on the labial surface. Such laterals invariably do not lap the centrals, but may in some instances be slightly lapped by the centrals, as in the Eskimo dentitions, Fig. 28, A, B, C, D,

E, also Fig. 1, *D* shows similar characteristics. These two distinctions are strongly indicative of conditions anteceding the crown eruption of the laterals and are suggestive of inalterable developmental modifications in form. Whether such modifications are merely chance variations or produced by some dominating force remains as yet to be determined, certain it is, that the two described positions of the laterals are closely associated with their form.

*B.**C.*

Fig. 28-*B*, *C*.—Right and left sides, showing normal occlusion of premolar-molar series and the lingual tendency of lateral incisors.

The lower incisors present less modifications in form as well as a less difference in proportions between the centrals and laterals. In position it may be noticed that the lower incisors are very rarely evenly aligned when the upper incisors are in exact proximate contact. This is true of all dentitions examined. The only exception noticed to this general observation is manifested when the upper incisors are spaced.

The canine of modern man as that in our primitive ancestor is not materially changed in form, from that in the earliest forerunner of the primate order,



Fig. 28-D.—Occlusal view of upper dental arch, showing tendency of central incisor to lap the lateral, primitive position of molars.



Fig. 28-E.—Occlusal view of lower dental arch, showing lapping of incisors and primitive position of canines. (Am. Mus. of Nat. Hist.)

Parapithecus. Unlike the canine in the lower apes and anthropoids, it remains a more generalized organ, while in the other primate families, this tooth has become specialized in adaptation for certain functions. Man through the progressive evolution of his brain developed the use of his hands and with the aid of certain implements, the canine functions of the anthropoids for grasping, tearing, cutting and fighting are substituted. It is therefore, not improbable, man may never have had large canine teeth resembling those of the apes, but rather may have developed along lines with small canines but with intelligent brain and skillful hands.

In position, the canine of modern man varies only in degree from that attained in the Heidelberg man, and not at all from the Neanderthal. In the upper jaw, its mesio-distal axis is so placed as to produce a continuity in the curve of



Fig. 29.—Mongolian Dentition. A.—Anterior view, showing normal occlusion with considerable overbite in the incisor region.

the incisors and that of the premolar-molar series, in contradistinction to the anthropoids where in position they partake of the arrangement in the alignment of the premolar-molar series alone. Although the Heidelberg and Gibraltar dentitions show a decided deviation from the ape mode of tooth arrangement, it is in the Neanderthal race that the position of the canine which we retain to this day is definitely established.

The lower canine, though somewhat reduced in dimensions from that of the ancestral predecessor, retains its primitive position with most accurate precision. It is a most curious fact, but nevertheless true, that the lower canine as well as the post canine lower teeth in modern man are found to follow quite closely the positions of the homologous teeth in primitive man. Thus, its labio-lingual axis quite frequently is directed antero-posteriorly and it still persists in associating itself with the incisor alignment, in contrast to the upper canine tendency.

The premolars are extremely erratic in size, form and position. In size they vary considerably in different races, in the individuals of each race and in the different teeth in the same dentition. Thus, usually the first upper premolars are larger than the second and *vice versa* in the lower jaw. But the exceptions to this rule are so numerous as to cause confusion as to the rule and the exception. In form they are bicuspidate in the upper jaw, and in the lower the first has a well developed buccal cusp and lingually it has accentuated cingulum or a vestigial cusp. The second lower premolar is either bicuspid or tricuspid. The tricuspid lower premolar simulates the primitive tritubercular form of tooth, with the protoconid, paraconid and metaconid. And in occlusion this tooth is representative of the wedge type of occlusion, the three cusps like those in primitive forms fitting between the upper premolars. The lingual cusp of the upper



Fig. 29-B.—Occlusal view of upper dental arch, showing flat incisors, the centrals tending to lap the laterals, primitive position of the molars and difference in arch outline from that of the lower.

second premolar occluding within the vestigial talonid basin formed by the distal marginal ridge distally and the buccal and disto-lingual cusp mesially. In position the premolars are also erratic. While the upper premolars, with some exceptions assume their positions in conformity with the canine-molar outline, the lower premolars assume positions resembling more those in the Neanderthal dental arch. The reason for such irregularity in position may only be found in the explanation of a general tendency toward irregularity in the shedding of the deciduous molars and eruption of the premolars, probably causally related to evolutionary processes. On the casual observation of this phenomenon, it has been found that in a large number of individuals with normal dentitions, these teeth exhibit such peculiarities. These peculiarities are also found to exist to a high degree in certain families.

Inasmuch as evolution has produced a change in the number of the incisors and premolars altering the original placental mammalian dental formula of 3, 1, 4, 3, by the reduction of one incisor and two premolars, on each side of each jaw it seems that its potency has not as yet been expended and is yet to be accounted for. The constant modification in form and position of the lateral incisors and the peculiarities associated with the premolars are undoubtedly most ominous phenomena regarding the fate of the future dental formula of Man in these particular regions.

The molars all retain their primitive form with the exception of the lower second tooth. The upper molars still possess the primitive cusp formula identified with the trigon, and while the first almost invariably has a hypocone, the second and third may have it at times well developed and at others vestigial in form or entirely lacking. The lower molars still retain the primate cusp formula lacking, of course, the paraconid in all and the hypoconulid in the second molar only.

As regards their position, it may be said in a general way that the molars



Fig. 29-C.—Occlusal aspect of the lower dental arch, showing lapping of incisors, primitive position of canines and difference in arch outline from that of the upper. (Am. Mus. of Nat. Hist.)

adhere to the primitive manner of aligning themselves in the dental arch. Thus, in the upper jaw, for instance, the mesio-distal axis is obliquely set to the outline of the dental arch; i.e., if a succession of lines be drawn parallel to the buccal surfaces of the upper molars, the anterior ends would be directed antero-externally. There may, however, be some slight variation to this position in the first molar only in certain instances, the second and third upper molars deviate very rarely from this position. And when they do, they approach more an anomalous manifestation.

In the lower jaw, the molars differ in position from those in the upper. The lower molars are arranged in such a manner as to place the buccal cusps in an evenly aligned series. It is only when the first upper molar deviates in the slightest manner from its primitive position that the lower second molar will be slightly rotated mesio-buccally.

The occlusion in the dentition of modern man has retained its primitive features *in toto*. The molars as in the primitive placental mammals, in the anthropoids and in primitive man still maintain the same relationship; the

protocone still fitting into the talonid basin, and the hypocone into that of the trigonid. In the premolars, the primitive wedge-type of occlusion persists; in the incisor-canine region, the edge-to-edge and overbite relation is manifest (see Fig. 14).

It must be emphasized at this point that the reason the evolutionist and paleontologist designate the molar occlusion by the lingual cusps in the upper and the fossae in the lower molars, is because first, these points constitute the most primitive form of molar occlusion and is still preserved in all mammals possessing molar or premolar teeth. Secondly, because of the extensive modification of the buccal aspect of the premolar-molar series, from the primitive tritubercular type to the omnivorous type of tooth, the buccal cusps were always obscured by various structures associated with that region of the tooth. Thirdly, the various forms of structures developing on the buccal surface of the molar teeth have invariably played a secondary part, mainly as an aid of the main functional portions of the crown. Lastly, the primitive cusps of the upper fitting into the fossae of the lower molars are associated with the primary functional activity as they are the elements constituting the mortar and pestle efficiency necessary in grinding and triturating the various food substances comprised in animal diet.

It would seem of considerable importance if the orthodontists would adopt a similar plan of procedure, especially with regard to the classification of the occlusal anomalies. As has been suggested above, the buccal cusps are at times liable to misrepresent the true relationship of the molars. By a slight rotation of the molar on its long axis antero-internally, the buccal cusps assume a point to point or distal relationship (Class II, Angle) while the mesio-lingual cusp of the upper molar (protocone) has as yet not exceeded its divergence from the primitive, normal position to justify such a classification if it be based on functional significance. Another important and to my mind fundamental reason for following the scientists' distinctions rests with the following fact: In aligning the teeth to any conceived form of dental arch, as proposed by various methods and schemes of determining or predetermining it, the buccal cusps of the upper molars and the buccal grooves of the lower molars are usually taken into consideration to a greater extent than is necessary.

As has been shown, the buccal aspects of the upper molar, in the best dentitions exhibited are arranged in a manner that is not in accord with such schemes but is in harmony, nevertheless, with the nature of the tooth and brought about by evolutionary processes. As it is a primitive feature still retained in modern man, it should receive more care and consideration before the primitive position is altered.

As evidence of the erroneous idea involved in the arrangement of the buccal cusps of the upper molars according to a certain arch outline may be observed that in almost all Class II cases of malocclusion, the molars as a rule are inverted from the primitive direction of the mesio-distal axis. Instead of the anterior direction being everted as under normal conditions it is inverted. One of the most important steps to be taken in all Class II cases is to restore the upper molar to its primitive position. And where the protocone has not exceeded the limits of its ancestral relation, the apparently "distal occlusion" will readily be

remedied without any other means. The assumption is, therefore, unavoidable that in a proper diagnosis of cases, as well as in their correct treatment, the lingual cusps of the upper molars are of greatest importance. And if in the various dental arch designs, this feature would be taken into consideration, they would be of more value than was hitherto the case.

In the lower jaw, the buccal cusps assume an homologous significance to that of the lingual cusps in the upper. However, what is of importance and must not be left out of sight at any time from the classification of a case to the completion of treatment, is the primitive points of occlusion, and if they be restored



Fig. 30.—*Dentition of Hindoo. A.*—Anterior view, showing normal occlusion with slight overbite of incisor.

in anomalous cases as they are retained under normal conditions, not overlooking, of course, the primitive positions characteristic of those teeth, the alignment of the buccal cusps of the upper, like that of the lingual cusps of the lower molars, will take care of itself.

DIVERGENT PECULIARITIES

The *divergent peculiarities* observed in relation to the dentitions examined, are manifested mainly in the form of the dental arches and in the manner of incisor occlusion, a characteristic of certain races. As the problem of the dental

arch form has been dealt with at a previous occasion it will suffice at present to demonstrate, in passing, such peculiarities in form as are existent in the three different races, the Mongolian, the Eskimo and the Hindoo, Figs. 28, 29, 30. Note the general outline of the upper dental arch, as compared with the lower, and note also the position of the canines in the different arch forms.

The other diversity refers to the incisor occlusion. Thus, it is a well established fact that in primitive man, as seen in *Homo Heidelbergensis* and *Homo Neanderthalensis*, the incisor occlusion was in an edge-to-edge relation. This



Fig. 30-B.—Occlusal view of upper dental arch, showing considerable difference in form from that in Fig. 29, and differing from its lower mate.



Fig. 30-C.—Occlusal aspect of lower dental arch, showing difference in form from that of the upper. (Am. Mus. of Nat. Hist.)

form of incisor occlusion seems to have been the prevailing type, until a quite recent period of geologic time. As Keith points out, "in Anglo-Saxon times almost the entire population possessed an edge-to-edge bite. After the lapse of less than a thousand years ninety-five per cent of the modern Englishmen possess an overbite." In the skulls examined the American Indians (Fig. 31) exhibit an edge-to-edge bite exclusively as do also the Eskimos. The European white (Fig. 32) and the natives of Asiatic South India (Fig. 30) present an overbite the extreme of which is reached in the Mongolians (Fig. 29.) Of

course, the number of skulls of the Hindoo and the White was so small that nothing of a definite opinion could be formed. But I am informed by Dr. Weinberger that the examination of the teeth of the Whites here during the recruiting activity revealed the fact that the edge-to-edge bite was prevalent in a high percentage of cases in the adults of military age examined for U. S. service.

Crystallizing the main ideas implied in the remarks made on this topic, the conclusions can not be avoided:

1. That hitherto the conception of "Normal Occlusion" was based upon an ideal insufficiently supported by concrete evidence.
2. That investigations of extensive collections of anatomic material reveal the fact that the best dentitions do not correspond to the conceived abstract ideal.
3. That interpretations based upon this fact must necessarily imply a con-



Fig. 31.—Dentition of American Indian, showing the prevailing edge-to-edge bite. (Am. Mus. of Nat. Hist.)

ception of the normal as encompassed within a border-line of such proportions that will permit of modifications in detail *without a change in type*.

4. That this border-line which permits of some modification in *individual manifestations* is what is termed the *territory of normal variation* and it belongs to the type by the right of *frequency* as does the "ideal" by the right of *perfection*. For instance, because "Sandow" represents the ideal in strength and physical development, it does not prove that all those not corresponding to such criterion, as represented by him, will be abnormal. It is the standard adhered to by the greatest number of individuals free from disease, weakness or deformity that decides the question of type or that of normality, and not the individual personifying an ideal that may have been artificially developed by intensive and careful training. He may be more rightfully considered the extreme.

5. That the illustrations, moreover, reveal the fact that although they present dentitions *considerably* superior to the average, they may not correspond with the *generally conceived ideal of the orthodontist*. It must, however, be conceded that they represent a normal type, *the human type of dentition*, and that this was developed along evolutionary lines as may be proved by the primitive feature still retained.

6. That these primitive features, embracing as they do such characters as number, form, position and occlusion of the teeth, must be of greater significance to the orthodontist than hitherto realized.

7. That since the orthodontist is mainly concerned with changes in *position* of teeth and their effect upon occlusion, it is of paramount importance for him to have a keen appreciation of the results obtained by Nature in her ceaseless efforts



Fig. 32.—Dentition of European White, showing the prevailing overbite. (Am. Mus. of Nat. Hist.)

during vast periods of time, as well as the means employed by her in retaining those modifications in the infinite variety of functional adaptations as revealed to us.

8. That since it is beyond the possibility of orthodontia to exert the slightest influence toward the modification of a tooth in its form, and since the tooth-form has retained most of its primitive features, it is imperative to base the modification in its position in accordance with these *ancestral characters* following the plan as laid down by evolutionary records. For, unless these conditions are fulfilled first, there will always be a tendency on the part of nature to assert herself by a modification of all orthodontic procedures not in accord with her dictates. If we would, therefore, work *with* nature and have her approval and assistance, we must confine our efforts in a more strenuous endeavor to learn to understand her, accept and appreciate her guidance by the recognition of her laws as laid

down in the form of all *primitive characters* and their various modifications as found to be associated with the dentition of man.

It is with considerable gratification that I acknowledge the valuable information obtained from the works mentioned below for the preparation of this paper. I also am greatly indebted to Dr. Wm. K. Gregory of the Museum of Natural History for his help, advice and judgment in the selection of extensive material for study.

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A RESUME OF CASES TREATED INVOLVING THIRD MOLAR INFLUENCE*

BY DR. H. L. MOREHOUSE, SPOKANE, WASH.

I FEEL that none of us are given to telling the other fellow of our mistakes as much as we should, for by our mistakes we learn the more, or at least we should. Therefore, I have two objects in view in presenting this paper, first to give a report of the cases I told you of two years ago and the satisfaction I have had from them; also to tell some of the disappointing things, not what would exactly be called failures, but delayed successes, for in the end I feel that I have overcome them as far as is within human possibility.

In the paper I gave two years ago, I cited cases where I had extracted impacted lower third molars and upper second molars in order to overcome the force exerted by them which threatened the future permanency of the cases, and many times practically prevented the satisfactory treatment of such cases.

The first case, I reported to you the last time, was that of a girl fifteen years old with a Class II, Division 1 case, in which I found by radiograms badly impacted upper and lower third molars. In the case of the lower thirds they were forcing the first and second molars into a position of supraocclusion and the impacted upper thirds made it impossible for me to obtain satisfactory mesio-distal occlusion. In this case I had the upper seconds removed and the lower thirds, and up to this time I have found no change in the normal relation of the teeth.

The next case was one of Class II, Division 2 in which radiograms disclosed only impacted lower third molars which were causing supraocclusion of the first and second lower molars, giving the effect of infraocclusion of the rest of the teeth. In this case the parents refused to have the lower thirds removed, delaying them for nearly a year, and finally when they were removed, it was apparent that

*Read before the Pacific Coast Society of Orthodontists, February 17-19, 1920, San Francisco, Cal.

Nature had filled in new bone beneath the first and second molars with the result that the teeth never returned to their original position and it was re-treated later in St. Paul as one of infraocclusion of the anterior teeth.

Fig. 3 is a case exactly like the one just described, with the exception of being a Class I case, but in this instance the parents saw to it that the removal of the lower thirds was done immediately upon my advice, and the teeth, after about

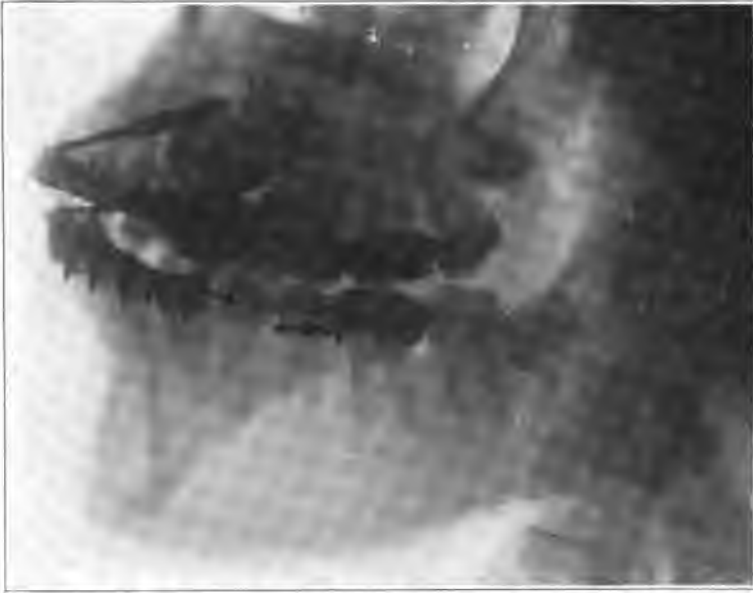


Fig. 1.



Fig. 2.

three months, settled back to their original position. When I saw the patient last fall, the normal occlusion had remained absolutely perfect.

Figs. 4 and 5 are of Class II, Division 2 case, mutilated on one side with an unerupted upper second premolar on the other. This case is similar to many that come into our hands, usually with both upper second premolars impacted, the first molars having taken the position of the impacted tooth. This slide will show you the condition that will develop if the first and second molars in these cases are moved to their normal position, namely badly impacted upper third molars and the second molars at such an angle as to be of very little use for mastication. As I told you in the beginning of my paper, this is to be an exchange of confidences and as such I must say that the question has arisen a good many



Fig. 3.

times in my mind just what was the proper policy to pursue in such cases as I just mentioned. Is it a more sane policy to extract the upper second molars and make room for the impacted premolars, letting the third molars later on take the place of the extracted second molars, or to advise the removal of the impacted premolars, thus reducing the time of treatment by over half? The last time I made mention of this point those who discussed the paper I think failed to note that I was trying to start a discussion. I hope that they will not overlook the fact this time.

Fig. 7 was one in which I had my greatest disappointment, for after I had treated this case of Class II, Division 1, and the teeth had held perfectly for a number of years, both upper and lower arches began to buckle, and the slide will

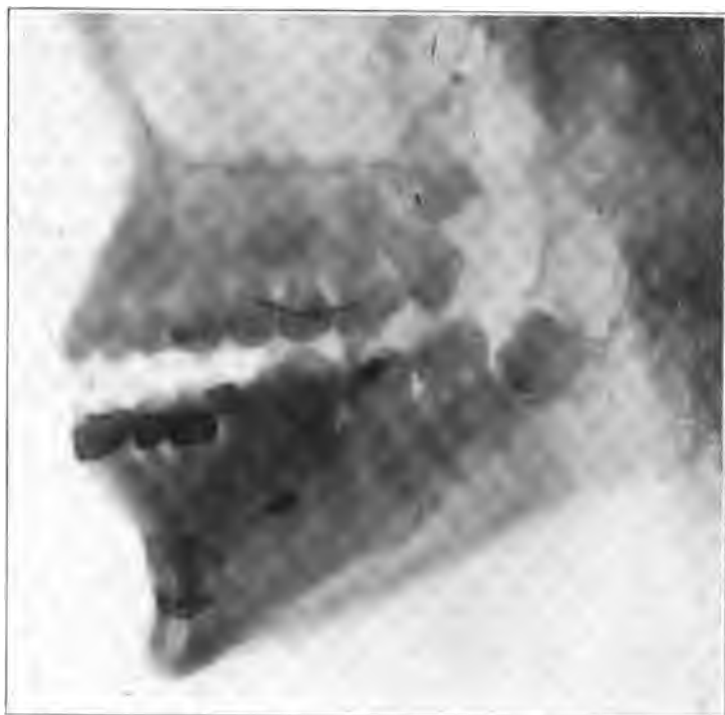


Fig. 4.



Fig. 5.

show the reason, and even then the parents and the young lady refused to have the third molars removed, and so far as I know have never had them removed, for I refused to be responsible any longer.

In connection with these cases I wish to call attention to those Class II cases in which the symphysis shows a lack of development. I feel that this type of Class II case needs a great deal more careful study, especially from the facial point of view, than any other. Dr. Angle says: "The study of orthodontia is indissolubly connected with that of art as related to the human face." The truth of this statement all of us realize more and more each year we practice, but, like many other things that we know, we lose sight of these ideals at times. It requires continuous study to keep our work up to the proper level, especially when noted artists tell us that we have no permanent standard in America on

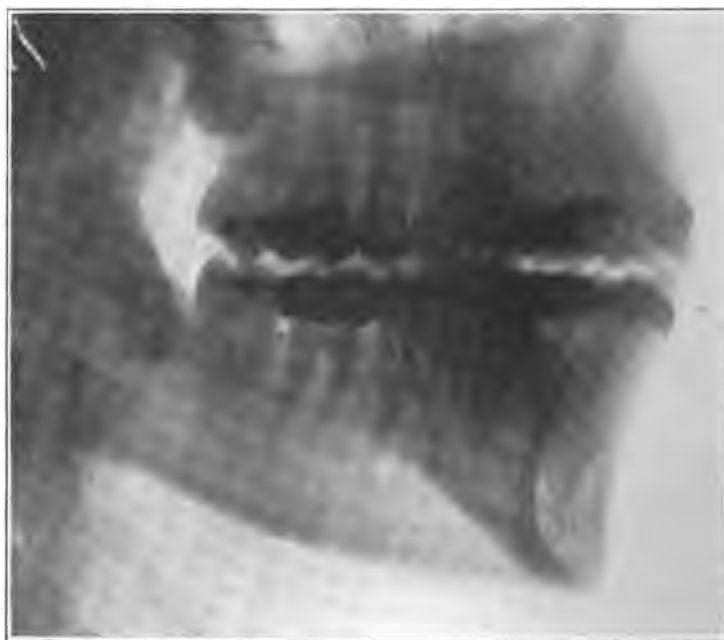


Fig. 6.

which to base our judgment, as did the Greeks and Romans, but we must work out each individual case as that type indicated. In an article by Dr. Angle, September, 1903, he stated that the best balance, the best harmony, the best proportion of the mouth in its relation to the other features requires that there should be the full complement of teeth, and each tooth shall occupy its normal position, i.e., normal occlusion. This law in possibly a large percentage of cases will hold true, but since the advent of radiography in orthodontia many of the unseen stumbling blocks have been revealed. Every once in a while the truth of this is burned more deeply in my mind when I meet in the store or on the street, an old patient whom I treated a number of years ago. In every instance where I have noticed the drifting mesially of buccal teeth, thus throwing out of balance the beautifully adjusted arches, the radiograms have disclosed impacted thirds.

The past five years in which I have been studying this condition I have never regretted having advised extractions to overcome the third molar influence. You have all heard the expression from parents and friends of some of your patients, "Jane's face seems too full, I do not think the treatment has benefited her appearance." To such I have endeavored to explain that there are two stages in a child's life in which if Nature has done her duty or has been assisted in creating the normal development of the jaws, the face from a line drawn just beneath the eyes appears to be overdeveloped. These two periods are from four to eight years and from twelve to fourteen or fifteen years.

It has been stated by good authority that the mesio-distal length of the upper and lower jaws should, if normal, have its full development (with the exception possibly of the third molar space), at eight years.



Fig. 7.

Formerly I did not believe that heredity had very much influence in cases of malocclusion, but I am more firmly of the belief that where the maxillary bones proper are involved, hereditary influences could be given as the etiology. One of the effects of this influence is these cases of Class II with undeveloped symphysis, and it is around these cases that I wish most of the discussion could rest.

I have about come to the conclusion that in these types of cases the best thing is the extraction of some teeth in the upper jaw. What teeth these should be cannot be laid down as a hard and fast rule. Here is where you can display your ability as a student of the facial art, in order that the appearance of the receding chin may be reduced to the minimum. (Please note I said appearance). For no matter how perfectly the teeth are moved in normal occlusion

there will still remain a facial unbalance). In a number of these cases I have found that the lower incisors were moved mesially beyond the point of development of symphysis which, of course, would throw into more prominence the look of undevelopment at that point with no hope of Nature overcoming the defect. In these cases I have extracted the upper second molar and allowed the lower teeth to drift distally to harmonize as far as possible the facial balance. This does not make a perfect art balance of the face, but relieves to a great degree what would otherwise be a bad facial deformity with normal occlusion.

The sad part of these cases is that usually the lack of development of the symphysis does not begin to show until about twelve years of age, so it raises the question whether it would give us more satisfactory results if the upper first premolars were extracted instead of the second molars. I have always felt I obtained a better balance of the features by the latter method. These types of cases have been some of the most trying I have had to deal with, because of this facial unbalance over which we have little control.

DISCUSSION

Dr. Leland E. Carter, San Francisco, Calif.—Dr. Morehouse is to be congratulated upon his most interesting and instructive paper. To use an old and time-worn expression "he has given us considerable food for thought."

Here we have a paper of inestimable value to the members of this society, written by one who has been a close observer and who has gathered many valuable facts from years of clinical experience. Theories without conclusive evidence cannot compare in value with such facts as this paper brings forth.

Dr. Morehouse besides giving us some interesting facts has presented some problems for our consideration and perhaps the clinical experience of some of the members of this society may furnish the necessary data from which to draw conclusions.

The paper merits a generous discussion, and I trust all present will take advantage of the opportunity to enlighten us further.

One of the outstanding features of this paper is that it is an eloquent argument in favor of the use of radiograms in connection with all cases of orthodontic interference. Without the x-ray Dr. Morehouse would not have been able to obtain ocular proof of the disturbing factors in these cases, and while I will not go so far as to say he would not have found a solution, there is no doubt, but that radiography relieved him of much worry and made his success more certain.

My own clinical experience substantiates the conclusions to be drawn from the first three cases mentioned and shown upon the screen; i.e., that the third molar is capable of causing malocclusion or preventing its permanent correction by exerting an unnatural force upon the other teeth in the arch, and that when good and sufficient evidence of its disturbing influence is obtainable, we are justified in extracting a tooth to relieve or overcome this force. No hard and fast rule can be laid down to govern these cases. We must take into consideration all the clinical factors and let our experience and judgment guide us in the selection of the tooth to be extracted.

For my own guidance in such cases I have adopted the following rules: First: Do not decide to extract until a careful study and restudy of the case has been made from articulated models and a radiographic survey, and until every available method of procedure without extraction has been carefully considered. Second: If extraction seems unavoidable, adopt the best method of correction without it and when, in the course of the operation it becomes absolutely evident that the desired result cannot be obtained in that way, it will still be time to extract and change the method of procedure.

Inasmuch as Dr. Morehouse has characterized the reading of his paper and its discussion as an exchange of confidences, I must admit that the problems presented in Figs. 4

and 5 have given me no little concern. I must confess that I have insufficient data derived from personal experience upon which to draw conclusions and therefore cannot discuss this phase of the subject in its entirety.

While I have had a great many cases with a premolar impacted on one or both sides, I have never found it necessary to resort to extraction, except the third molar. The proper procedure, of course, depends upon the clinical factors encountered and no hard and fast rule can be formulated covering these cases. We must take into consideration that condition of the investing tissues as well as the erupted and unerupted teeth.

All data and clinical experience in the treatment of these cases is valuable and I trust the following discussion will bring forth some case records.

In reference to Class II, cases complicated by a lack of development in the region of the symphysis menti, I was of the opinion that due to the fact that ossification of the mandible is completed very early in life such a lack of development would be noticeable long before the twelfth year. As to whether or not these cases are the result of hereditary influences there seems to be a considerable difference of opinion. However, I am of the opinion that some of the failures in these cases are due to the fact that the patient allows the mandible to move forward thus overcoming the pull of the intermaxillary rubbers and leading one into believing the teeth have moved. Where the appliances are removed, the jaw gradually moves back into its old position and the case is said to have relapsed. There are some cases, however, that do not seem to respond to treatment, such as Dr. Morehouse has mentioned, and it will be interesting and instructive to hear the views of some of the older and more experienced members of this society.

In conclusion I wish to thank Dr. Morehouse for having given me some very profitable moments, and I am sure that all present are better off for having listened to his paper.

Dr. A. A. Solley, San Francisco, Cal.—I am coming more and more to believe that radiograms are as important as are our models, and I think we should not undertake any case without first getting a complete set of x-rays. In regard to lack of development of the symphysis in Dr. Morehouse's case, I wish I had known he was presenting it as I have a duplicate of it, and it has been under my care about five years. But this one showed up about the fourteenth year, and I thought I had a pretty fair result until a year and a half ago, when the case came back and I had a shock when I saw it. Like Dr. Morehouse, I was quite in despair. However I have placed the patient in charge of a gymnastic teacher. We are trying to get the child to work on the bar, with the chin resting there for support, and see whether that will help. I will promise Dr. Morehouse to give particular attention to this case, and probably in the next year or so can give him complete data.

Dr. John V. Mershon, Philadelphia, Pa.—I am deeply interested in the subject presented by Dr. Morehouse. When a subject is presented to which you agree you think it is well done no matter how bad it may be. This is no reflection on Doctor Morehouse's paper. What impressed me in the pictures and in the presentation of facts by Doctor Morehouse, was how he has proved that the orthodontic problem is not primarily a tooth problem. It is a developmental problem.

Cases that come to the orthodontist present themselves because there is a failure on the part of Nature to develop the human being according to Nature's predesigned plan. If the development of the individual was according to this predesigned conception of Nature he would not come to us. If we could only think in terms of growth and development and not in terms of teeth, and study growth as a problem whether in plants or in the lower animals.

Growth is not continuous, it does not take place in all parts of the body in perfect unison. A child may go on for several years with no increase in girth, but all the increase may be in height. One period may show growth of the arms, then of the chest, you may have it in the face likewise, and we expect when treating our cases with mechanical appliances to apply force with mechanical efficiency, (which should be physiologic efficiency) and have the patients to progress and develop in two or three years to a degree that nature under the most favorable circumstances requires eighteen to twenty years to accomplish in the devel-

opment of the face, it cannot be done. Many patients that we have dismissed at fifteen or sixteen years of age possibly will not arrive at a complement of development until possibly twenty-five or twenty-six years of age. One child may be in a certain grade in school at eight, another at ten or twelve, and so on. We have a mental age, a dental age, and a developmental age, and all may be different.

A diagnosis cannot be made from models. A model is an inanimate thing, it shows only the tooth arrangement.

You must know your individual, you must see your patient and examine him. It is my practice to make a physical examination of the child. With my imperfect knowledge and poor facilities you can imagine how imperfect that examination, and yet I find where I have a marked malocclusion, I can find physical defects in body development. Frequently I can detect a curvature of the spine, lack of muscle tone, and so forth. You will find many children with ankles beginning to show evidence of fallen arches, and you will find the muscles of the mouth weak and flabby. We only treat locally and mechanically the symptoms which are general constitutional conditions.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Necessity of a Knowledge of Differential Diagnosis in the Therapeutics of Focal Affection. Reed. Dental Cosmos, July, 1920, lxii, No. 7.

When a physician sends a patient with rheumatism or nephritis to the dentist for examination of the teeth, the dentist calls in the radiographer, and when the latter indicates that certain teeth are abscessed or beyond repair, removes them, but very likely without benefit. After a few such experiences both doctor and dentist become disgusted and abandon outright the conception of focal infection in pathology. To obviate this state of affairs patients should not be referred to the dentist on the merest suspicion, but a diagnosis of focal infection should be built up from an entire investigation of the organism. The history and presence of a diseased mouth may be the sole etiologic factor which can be isolated, or may be only one of several; in which case the infected mouth may only be a contributory factor and in the latter case extraction will not affect a cure. The author has found syphilis a conspicuous factor in alleged focal infections. That is, the condition was not focal infection but syphilitic manifestations which in association with a bad mouth mimicked focal infection. Another class of patients often wrongly regarded as of this type complain of chronic digestive disorders which they ascribe to bad teeth. In a case in point the primary condition was gallstone disease which had apparently contributed to the presence of infected mouth. Foreign bodies, painful flat feet, spinal growths, are a few of the conditions which may wrongly be referred to bad teeth. The author implies that a diagnosis of focal infection should be made by exclusion of all other possibilities.

Vincent's Stomatitis and Associated Manifestations. Buehler. Dental Cosmos, July, 1920, lxii, No. 7.

The author reports jointly on 175 cases of Vincent's stomatitis and 153 cases of pyorrhea alveolaris. The affections are associated because the bacteriology was identical, every case of either affection, showing the peculiar spirochete and fusiform bacillus. Symptoms of stomatitis were typical, comprising sore gums which bled on the slightest contact, fetor of breath, rusty or bloody sputum, swollen gums with small ulcers covered with membrane, malaise, defective mas-

tication, and secondary involvements. The four locations so-called are the gums, buccal mucosa, hard and soft palate and fauces, and at least two of these are involved in the majority of cases—and one of the two is the gums. The causal factors are defective or absent oral hygiene, faulty crown and bridge work, poorly inserted fillings and traumatic malocclusion. It will be noted that the author does not allude once to cutting the wisdom teeth or similar developmental factors. There is no allusion to gangrenous stomatitis. Diagnosis is always made with the microscope and bacteriologic technic for it is necessary always to exclude both diphtheria and syphilis. Treatment which should be kept up until the mouth is sterile of the organisms, consists of dental work such as scaling, and disinfection by the usual buccal antiseptics, 20 per cent sulphate of copper solution being employed as a mouth spray. This salt may almost be regarded as a specific for Vincent's stomatitis and should be used as a wash as well as spray. The author goes minutely into the technics of salvarsan exhibition. It is hardly necessary to add that from the author's views pyorrhea alveolaris, being of the same origin, receives the very same treatment as stomatitis and the author does not attempt to treat the roots at all.

Dental Sepsis in Children: its Consequences and Treatment. F. S. Steadman. Proceedings Royal Society Medicine, London, 1920, xiii, Sect. Odontol., 37.

The author formerly shared the popular opinion that the condition of pale-faced, tired-looking, under-weight, and mentally inefficient children was usually the result of semi-starvation due to poverty. He has discovered, however, that in a large percentage of cases carious deciduous teeth and first permanent molars, exposed and putrescent pulps, and abscesses about the teeth are etiologic factors, and that extraction of the teeth is followed by restoration to health.

One of the chief causes of the deterioration in health is loss of sleep due to the pain associated with the dental condition. Other causes are gastrointestinal disorders. The rapid clearing up of the latter after the extraction of the teeth is similar to the improvement noted by Waller in sickly breast-fed babies after the extraction of septic teeth in the mother. Oral sepsis may aggravate existing anæmia, tuberculosis, typhoid, and scarlet fever and may result also in septicæmia and endocarditis. Locally it may spread to adjacent tissues causing pharyngitis, tonsillitis, otitis media, etc. Finally it may be the cause of enlargement of the lymphatics draining the area involved. This clears up if extraction is done early.

The author's treatment consists in the extraction of all deciduous teeth with infected pulps and generally of their antagonists in addition. Permanent molar teeth with roots not fully formed are also extracted. Pulp capping is condemned. The argument that extensive extraction is not advisable as it causes a loss of the power of mastication is futile as this power is already lost before the extraction. No child will masticate on tender teeth and exposed pulps. The argument that extraction prevents the proper growth and development of the jaws is also untenable in the majority of cases. Unilateral mastication should be prevented as it causes a marked gingivitis on the unused side. All condemned teeth should be extracted at one time under a general anæsthetic such as ethyl chloride.

Osteomyelitis and Osteoperiostitis of Dental Origin. Landetey Arago. *La Odontologia*, March, 1920, xxix, No. 3.

The author considers maxillary osteomyelitis of dental origin which does not arise unless the pathogenic organisms have actually gained the interior of the bone, as through infected pulp or alveolodental "arthritis." In cases of extraction with fracture of the alveolar process an opening is apparently made for the entrance of germs. The fact that extraction is often followed by necrosis of the maxilla was known as far back as Heister's time and this author warned against extraction in inflammatory affections of the jaws. In such cases, however, the germs have really penetrated into the substance of the bone before extraction. Jarre has shown the frequent connection between affections of the six year molars and osteomyelitis. The author has made numerous bacteriologic studies and finds that the germ content is very mixed, no less than 6 or 7 organisms being present in more or less of symbiosis: in the order of frequency these are the staphylococcus, pseudodiphtheritic bacillus, streptococcus, Vincent's fusospirillary association, various gram-negative diplococci, bacilli of the coli type and Pfeiffer's coccobacillus. Several photographs of cases with the sequestra and radiographs are appended. In several of the cases the entire lower jaw was involved in the necrotic process, while in one there was a spontaneous fracture of the bone. In a case of chronic osteomyelitis the swelling suggests that of a sarcoma. Cases of angular and diffuse osteomyelitis cause characteristic unilateral and bilateral deformities. The article will be continued in the following issue.

Report of Two Cases of Lung Abscess Following Tonsillectomy Under Local Anaesthesia in Tubercular Subjects. J. R. Simpson and H. G. Noah. *Pennsylvania Medical Journal*, 1920, xxiii, 322.

Contrary to the commonly accepted view relative to the causation of lung abscess following tonsillectomy, the authors believe the two cases here reported were due to hematogenous infection because of the following facts:

1. Both patients were operated on under local anæsthesia in the upright position.
2. The mouths and throats were in a septic condition before and for some time after the operation.
3. The late development of symptoms (eleven and twelve days after operation) points to a blood-stream infection.
4. The abscess developed at the site of the tuberculous lesion which in both cases was in the upper and middle lobes.

The conclusions drawn are:

1. During or following operation septic material enters the veins, passes through the right ear to the lungs and, in the presence of a tuberculous lesion, finds there suitable soil for the formation of an abscess.
2. The possibility that the aspiration of infected material may be a cause of pulmonary abscess is not to be denied, yet a greater number of such abscesses occur as a result of hæmatogenous infection than is generally supposed.

Surgery of the Tonsil. H. C. Todd. *Journal Oklahoma State Medical Association*, 1920, xii, 100.

In the author's opinion adhesions and contractures following certain tonsil operations are due to: (1) trauma or destruction of the tonsillar plicæ or the tearing of their attachments, or (2) trauma or destruction of the muscles or their aponeuroses which form the tonsillar fossæ.

The plicæ, anterior and posterior, are the superficial layers of the mucous membrane in which the tonsil is developed. The structures deepest in the tonsillar fossæ are the musculature of the tonsillar pillars. The superficial structures are, first, the aponeuroses of these muscles; next, the basement membrane of the mucous membrane enveloping the tonsil; next, the tonsil itself; and then the anterior and posterior plicæ, the layers of the mucosa other than the basement membrane which lie upon the tonsil and partly envelope it. The anterior plica or plica triangularis alone is constant, but both, when present, are continuous at the tonsillar margins with the mucosa of the tonsillar pillars and therefore with pharyngeal walls.

The author contends that these plicæ must be carefully dissected up rather than torn from the subjacent tonsil. Next, the capsule should be separated from the muscular aponeuroses without injury to the latter or the now loosened plicæ. For this step especially Todd recommends tonsillar scissors or Pierce's sharp spoon dissector. In the next step in the operation the base is detached with the aid of a snare.

When the plicæ are preserved they partially line the emptied fossa without contractures and give off epithelial buds which further hasten a smooth healing.

Three Cases of Death Following Injection and Extraction. Ritter. *Zahn-aerztliche Rundschau*, June 8, 1920, xxix, No. 23.

In the first case a patient was sent to the author, who is a forensic expert, by a practising dentist. The face was swollen on both sides, the lower jaw painful to the touch and there was fluctuation over it with marked general reaction including fever. Incisions were made along the alveolar border, with cold poultices, and some improvement resulted but as sepsis seemed impending the case was sent to the hospital and ended in death. It was brought out that patient had originally visited a dentist who anesthetized the gum although at the time it was swollen. The effect of the injection was the formation of an abscess—a phlegmon of the floor of the mouth, which led to sepsis. It is not known that the injection was actually responsible for the phlegmon for the latter occurs spontaneously. Operation failed to save the patient. Phlegmon of the floor of the mouth most commonly follows caries of the teeth to which has been superadded inflammation of the periosteum of the root. It is not necessarily to be inferred that injections act in these cases as contributory factors. In this case no extractions are mentioned and the injections—probably of a mixture containing cocaine—appear to have been given to relieve the pain of the ulcerated tooth. In the second case two injections of novocaine into the gum preparatory to extraction ended fatally in a short time. The patient collapsed as a result of the injections and then went into a fatal swoon when the tooth was pulled. In the third case

the tooth in question was a bicuspid which was giving much pain and the dentist extracted it after the usual novocaine injections. The lower jaw then swelled to such an extent that patient was sent to the hospital where he died of sepsis. But the empty socket where the tooth had been exhibited no inflammatory reaction and the expert declaration was to the effect that the exact cause of the sepsis was a mystery.

Conduction Anesthesia in Buccodental Surgery. Bercher. *La Revue de Stomatologie*, 1920, xxii, No. 5.

Credit for introducing this form of anesthesia in France is due to Pauchet, whose technic has been followed by numerous authors with or without slight modification. The mouth, teeth and lower face are supplied by the superior and inferior maxillary branches of the trigeminus, so that nerve blocking in surgery in these regions must be directed to one or both of these nerve trunks. The ophthalmic branch has no interest for the stomatologist. The superior maxillary is purely a sensory nerve, the inferior has in addition motor fibers. Blocking the superior branch may be affected by three routes, the anterior or orbital, the inferior or buccal, and the external or malar. The first named is of theoretical importance only, for the patient will not consent as a rule to a puncture in the orbit. The second or buccal route is condemned by the author for two reasons—inefficiency and hazard of injury. There remains the external route as recommended by Matas and the only one which appeals to the author. The technical steps are too long to reproduce and may be found in systematic works. In regard to the inferior dental nerve, it is not necessary to block the main trunk, for this step can be limited to the inferior dental branch which is accessible at the internal aspect of the ascending ramus before it enters the bony canal, at the level of Spix's spine. The author uses either 2 per cent stovaine or 2 per cent novocaine with adrenaline addition. Indications for nerve blocking are numerous and need not be recapitulated. As for the results with proper technic these are constant and perfect; the author has had but three backsets not to be charged to the method. This does not mean that there are no complications, for the author has had cases of partial syncope due apparently to the use of the sitting posture and some postoperative inconvenience which yields to aspirin.

Phlegmon of the Chin Region. Herpin. *La Revue de Stomatologie*, 1920, xxii, No. 5.

The author reports a case of phlegmon the origin of which was unsuspected over a period of seven years. In 1903 a young lad of 12 years exhibited a progressive swelling in the region of the chin without premonitory symptoms. It reached its maximum in about a week, when a provincial dentist extracted certain temporary teeth, accidentally including a permanent lower canine. The swelling was not favorably influenced and pulsation and lymphnode enlargement were noted. The mass was now opened with the thermocautery, much pus issuing with rapid subsidence of the swelling and other symptoms. The cause of the lesion was unsuspected. There was a latent interval of 3 years at which

juncture a new swelling appeared in the same area. The dentist removed a carious lower molar, the abscess matured as before and was as before opened with the thermocautery, with the same result. Another latent interval of four years was followed by a third tumefaction of the chin, this time apparently determined by a blow. The condition was unlike the preceding for when the swelling was lanced on either side of the chin no pus appeared. A surgeon was now called in and made an extensive horse-shoe incision which gave vent to much purulent fluid. The resulting wound was drained for a month before it healed. The x-ray threw no light on the nature of the process. In another three months there was a recrudescence and a decayed molar was removed without benefit. The author now saw the case for the first time and found a small fistulous tract to the left of the frenum of the lower lip leading to the root of a discolored lower lateral incisor. This evidently marked a slight injury received in childhood while engaged in boxing. The necrotic root of this tooth had evidently been responsible for all the mischief and upon its removal there was no further trouble.

Actinomycosis Considered Specially In Its Relationship To The Jaws.
V. Zachary Cope. *The British Dental Journal*, 1920, xli, No. 14, p. 649.

Chronic inflammation caused by infection with the ray-fungus, a streptothrix, is of fairly frequent occurrence, especially in the region of the lower jaw. Infections round the face, neck and jaws outnumber all those in other parts, the buccal region being by far the most common to be infected. If infection takes place through the gums or teeth of the lower jaw, there may result a small induration on the outer aspect of the horizontal ramus, or a more extensive condition involving the cheek and parotid region, the most typical form of actinomycosis. The lower jaw may be the seat of a primary focus which starts by the entry of the streptothrix through a diseased tooth socket. Submaxillary infection is undoubtedly in some cases the result of the fungus gaining access along Wharton's duct, but it is not likely that the more common mode of entry of the organism is through the mucous membrane of the floor of the mouth or alveolar margin. Secondary infection is common; the mouth contains many varieties of bacteria, and these frequently gain access to the tissues at the same time as the streptothrix. The skin over a buccal actinomycotic focus is usually unaffected for some time.

Cervico facial actinomycosis, which causes a swelling of the side of the face and the region of the angle of the jaw, presumably has its origin, in the majority of cases, through an entry of the fungus into the connective tissues of the gum near the lower molar teeth. In some cases the only abnormality discovered inside the mouth has been a carious lower molar or its stump. In younger persons with perfect teeth, an opportunity of entry for the fungus may be furnished by the eruption of a tooth. This form of disease is characterized by a swelling of the cheek, which extends from the zygoma above to the inferior border of the mandible below, and from the ear to the anterior border of the masseter. Within three or four weeks a firm swelling is formed which has its maximum at the junction of the horizontal and ascending rami of the jaw. A marked symptom at this stage is trismus, the patient experiencing great diffi-

culty in opening his mouth. The further course may be one of progressive hardening or softening; the latter leads to the formation of an abscess containing the typical granular. The best and only certain way of diagnosing the condition early is a routine examination of the discharge from all chronic abscesses. Actinomycosis in the buccal region must be differentiated from many other pathologic conditions. Treatment yields best results in the face and neck regions. If the lesion is in a region where the whole affected area can be removed the prognosis is very good, but excision of the whole infected area is rarely possible.

The Focal Theory of Infection In Its Application to The Teeth. Howe.
Journal of the National Dental Association, July, 1920, vii, 7.

The author's conclusions to his article, which is a serial one, are in part as follows: the experimental evidence as to the dental causation of general diseases is not satisfactory, as there are other and more natural explanations. Much harm, little good, has come from this mistaken viewpoint. The teeth are an essential part of the organism and the disturbances which occur about them are local and amenable to local treatment. Diseased areas should be cleaned up and without the infliction of any kind of trauma. X-ray shadows are not equivalent to disease, for cicatricial tissue present the same appearances. Toothless people are not free from the troubles attributable to diseased teeth. Bacteria are not necessarily pathogenic. At the present time we are overrating infection as a cause of disease and underrating other factors such as high-tension living and errors of personal hygiene. The genuine infections about the teeth, which are rarely seen and which may be guilty of some of the charges made, never occur in a person who is under the care of a good dentist; but even in such a case the poor general condition would be more apt to be the cause and the dental infection the result than the reverse state of affairs. In thirty years practice the author has never seen a case of streptococcus viridans infection which proceeded from the teeth. In alleged root infections the streptococci may not represent the original focus but may themselves have gained the locality from some true primary focus. It is possible by means of the technic in use to prove that a large proportion of teeth with normal pulp are infected. The author will continue his serial article with the subject of root canal filling.

Ludwig's Angina; Vaccine Treatment. Sahagun Torres. *La Odontologia*, March, 1920, xxix, No. 3.

The French object to the term "Ludwig's angina" because they make the claim that Geusoul anticipated him in the recognition of this condition by six years, and further because the condition is not an angina, but a septic phlegmon or submaxillary cellulitis or sublingual phlegmon. The mortality of this affection is still notably high—about 60 per cent. Left to themselves, four out of five patients die and in late intervention three out of five. In a material of unselected cases 38 patients sustained 17 fatalities. Of the 21 recovered cases 12 had received surgical treatment. On the other hand in 14 modern cases with timely intervention but 4 deaths occurred. The author relates a personal case at great

length. By reason of the gravity of the case and the likelihood that despite operative intervention a fatal result might not be averted the author obtained pure culture of staphylococci (polyvalent). At 8 o'clock in the morning, 24 hours after the inception of the symptoms, an injection was made in the right deltoid region. A negative phase developed with aggravation of the symptoms which was followed by improvement, and six hours after this injection the fever had dropped 3 degrees and the patient was sweating. The injections were repeated, and while the improvement was not striking, it was constant and unmistakable. On the third day pus came away through a fistulous opening and from this time improvement was rapid.

The Dental Hygienist as a Factor In Dental Progress. A. H. Stevenson. *New York Medical Journal*, 1920, iii, No. 24, p. 1024.

The author summarizes his presentation of the subject in concrete form as follows: (1) The dentist as the guardian of the oral health of the community can no longer disregard preventive measures as a part of daily practice. (2) The prevalence of dental caries should be minimized by systematic oral prophylaxis under the direction of the dentist. (3) If the burden of professional duties prevents the dentist from giving this service to his patient he should provide adequate assistance. (4) The dental hygienists should be properly trained and regulated by law. Where she has been given opportunity she has met all expectations. (5) Whether she labors in a private office or in public institutions, she is rendering humanitarian service and the future distribution of her labor will ultimately be adjusted by the law of supply and demand. (6) The dental hygienist is an important factor in the progress of dentistry and the elevation of her service is a matter of concern to the dental profession which shall always supervise her activities. (7) It devolves upon the dental societies to instigate appropriate legislation legalizing the dental hygienist in every state in the Union, as all such legislation should be initiated by the dental profession.

Bone-Grafting Of The Fractured Mandible. Gilbert Chubb. *The Lancet*, London, 1920, ii, p. 9.

Summary:—The series consists of 60 consecutive cases of bone-grafted mandibles. Of these all but two were free autogenous grafts from the ilium. Fifty-one possessed edentulous posterior fragments and in 40 of these the loss involved the region of the angle. In 16 of the latter the loss involved the ascending ramus also. Firm bony union was obtained in 56 of the cases, 93 per cent of the series.

The graft and jaw fragments were so trimmed as to fit accurately end to end, with the largest obtainable areas of exposed vascular bone tissue held in close contact by firm wiring. The close apposition results in early bony union, while the firm fixation allows of the bones being subjected at once to some degree of muscular strain without fear of displacement, thus leading to the early consolidation of the primary union. In over 60 per cent of the successful cases the union was of ivory hardness on the final removal of the splints, three to four months after operation.

Precocious Alveolar Atrophy. Kuntz. *Zahntechnische Reform*, July 11, 1920, xxiv, 28.

The author first mentions the great interest at present in alveolar pyorrhea, with especial reference to the neosalvarsan treatment; which by the way is not fulfilling the early hopes engendered by the supposed spirochetic causation of that disease. But this attitude takes no account of presenile atrophy of the alveoli and certain gingivites. Among the latter there is said to be one which is attributable to the biting quality of English cigarettes now sold in Germany. Presenile atrophy begins in middle age and is not accompanied by any failure of nutrition and the forces. The symptomatology of presenile agrees closely with that of senile atrophy. The teeth appear longer than normal while the gums are quite intact. There are no pockets as in pyorrhea. The exposed necks of the teeth appear sound and generally speaking presenile atrophy, like pyorrhea itself, does not occur in carious mouths. The subjects have usually taken care of their teeth. The sensitive dentine has its natural sensibility much reduced. The dentist can drill close to the pulp without causing pain, and sometimes the sound pulp cavity is entered without pain. This means that the pulp itself is undergoing atrophy. It is singular that those who suffer from presenile atrophy are mostly people of good constitutions and otherwise well preserved. The only causal factor which can be accused is malocclusion and neither infection nor constitutional disease will explain the condition. It may be said, moreover, that the condition attacks the better classes—the educated and well to do—whence neurotic causal factors have been evoked. Excessive and improper use of the toothbrush is not mentioned by the author as a possible causal factor. The article closes with case histories.

Influence Of Buccodental Sepsis And Periapical Foci On The General Condition. Lagrange. *La Revue de Stomatologie*, 1920, xxii, No. 6.

The author gives in detail six cases in addition to discussing the entire subject. His conclusions are as follows: in any suspicious case there should be a thorough examination of the dental system. Any treatment carried out should be as conservative as possible. If no other foci or explanation of the condition can be found other than the teeth pulpectomy should be preferred to avulsion in the attempt to preserve devitalized teeth. Devitalization of sound teeth, however, should be regarded as a very serious matter.

The author's second case is as follows: Patient, a girl of sixteen, all teeth living (but some with nonpenetrating caries which had been filled by the author) with two exceptions, recognized as having necrotic pulps. These were the two upper left premolars. The dead pulps were removed entire, the canals filled with eugenol and the cavities obturated with cotton and varnish. The patient was expected to return in two days but was not seen again until five months. She had had no trouble until attacked with severe pains in the left thorax two months before. The dressings were removed and a necrotic odor noted. The apical region was very sensitive to pressure. The author did a preliminary disinfection of the canals and the pains at once improved. They did not vanish entirely until the tooth had been extracted.

Anesthesia By Intraligamentous Injection. Chompret, *La Revue de Stomatologie*, 1920, xxii, No. 6.

The author refers to the circular and intraalveolar ligaments. Thus far but little attention has been paid to anesthetization of the tissues which connect the teeth with their sockets and which are ruptured when the teeth are extracted. It is considered sufficient to inject the solution into the cellular submucous tissue of the gums. In this manner the terminal ramifications of the sensory nerves are not reached. After the injection the solution infiltrates into the periosteum, the osseous alveolus and the intraalveolar ligament last of all. Fortunately the circular ligament, being directly continuous with the mucosa, comes under the anesthetic promptly. The thicker and denser the alveolar process, the more it is calcified, the longer it takes to secure analgesia and the latter may even fail to involve the intraalveolar ligament of a given tooth which is to be extracted. The author has recommended this field of anesthesia for the past 15 years. Nogue in his work on anesthesia mentions it, but adds that it has not been found practicable. The author insists that this statement is an error and gives his technic as follows: he takes the finest needle obtainable, having the length of 1 cm., of which the bevel must not be too sharp. This is directed perpendicularly to the axis of the tooth and buried directly into the circular ligament. As this puncture may be painful the gum is first rubbed with a mixture of cocaine, menthol and phenol, one gram each. One minim each is injected into the mesial and distal aspects of the tooth. This procedure anesthetizes only the circular ligament, however, and to reach the intraalveolar ligament the syringe should make an angle of 20 degrees or more with the axis of the tooth, with the bevel of the needle in contact with the neck on either the mesial or distal side, passing directly beneath the circular ligament, and as far as possible into the alveolo-dental articulation, toward the apex of the root.

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EDITORIALS

The Art of Healing

PROFESSOR Arthur Keith, M.D., of London, England, in his inaugural address at the summer meeting of the Incorporated Society of Trained Masseuses, June 29, 1920, discussed the art of healing in relation to teeth. The following is extracted from his address published in the *Lancet*, London.

There are no parts of the body which can better help us to understand the true nature of the art of healing than those structures with which we have been familiar from infancy upwards—our teeth. That most prevalent of all diseases, caries of the teeth, we all have had experience with at first hand. One morning we are surprised to find—or, if we are in the happier position of being able to afford regular visits to a dentist, our dentist is surprised to find—a hole or ulcer eating into a tooth without our being aware of the fact, there having been not the slightest warning or pain. Pain comes when the pulp cavity is reached—pain and plenty of it; but that is too late for Nature to step in and give us a pre-

ventive warning. If a sore or ulcer had formed on the cheek we should have been instantly aware of our danger and have been able to take measures for treatment. We should also know that, in most cases of ulcer or sore, repair will set in and heal the breach. But a hole or ulcer in a tooth will not heal, try how we will; it has no power of repair. The best a dentist can do for us is to clear out the dead tissue, introduce a stopping, and thus avert the disease. The most skilled dentists in the world cannot heal a tooth, cannot make the wall of the cavity produce fresh dentine and new enamel and thus restore the breach; his failure is not his fault, but that of Nature, because she has not given our teeth, for a reason I will explain presently, that virtue or healing power which she has most bountifully bestowed on all the other structures and tissues of our bodies. You will see the point I am trying to score—*viz.*, that if Nature had not endowed our bodies with the power to heal, neither the surgeon, physician, nor masseuse could have done anything whatsoever for the cure of injury or of disease. They could have done no more—perhaps not so much—than the dentist can do for our teeth. They could only have stitched tears of the skin or stopped holes in the flesh. Conceive our condition if such had been the case; the hundreds of men who had broken bones in the accidents of civil life would be walking the streets in splints for the rest of their lives; every one of us would be covered with stitched cuts—often in want of renewal—or with holes which constantly wanted re-stopping, or with ulcers ever weeping, or bruises unchangeably colored as the rainbow. A modern city would be a warren of surgical out-patients, had Nature not endowed the rest of the body better than the teeth. Think of the condition of our soldiers at the end of a war if their bodies had forgotten how to heal! If we remember these things you will see that when we claim a cure we should not forget how much of our success we owe to the bounties of Dame Nature.

Why has Nature been so culpably negligent as to leave our teeth healingness? It is worth some trouble to look into this matter if only to learn how remarkably prudent she has been on our behalf in all her works. If our teeth had been provided with nerves as freely as our skin, then we should have had warning of the first onset of caries, and could have taken steps to remove the disease at its beginning. But then, what about cracking nuts and chewing roots and tough meat, as primitive man had to do? Eating would have been too painful a process to be indulged in. Nature did her best to secure attention to the teeth by awarding the most excruciating of pains to those who do neglect their teeth. Under the circumstances which conditioned her handiwork she could do no more. But lack of nerves does not explain why teeth have no power to heal, although I think that those parts of the body which are most liberally supplied with nerves of common sensation have a better power of healing than those which have a poor supply. The chief reason was that the substance of the teeth had to be made so hard and resistant that it was impossible to introduce into the enamel or dentine those soft living units which we speak of as cells. It is in these living cells that the power to heal lies; enamel cannot mend a breach in itself because it has no cells; bone can, because everywhere it provides minute but comfortable nests or residences for the numerous living units scattered through its substance. If

we would understand the art of healing, then we must know something of the living units in which the power to heal resides.

We must not think that every cell in the human body can play a part in the act of healing. A nerve cell, and it is so also with a cartilage cell, cannot even mend its own body, much less take a part in the healing of a breach or wound; if injured they die. The epithelial cells which cover the skin can, as you know, multiply, spread, and thus cover over any superficial breach of the body. The epithelium which lines the stomach, bowel, windpipe and other canals and passages of the body have also this power. But the cells which have been furnished with the greatest degree of healing power are those of the white connective tissues—the tissues which bind the skin down to the underlying parts and which join together the various parts of the body. Let us suppose a muscle has been ruptured or torn, such as the biceps of the arm. Blood oozes into and fills the tear or breach in the muscle. Immediately messages go out, of kinds we do not yet know, and summon from the rest of the body millions of white blood corpuscles to the site of the injury—the workmen who have to clear away the debris caused by the accident. What interests us most, however, is the behavior of the connective tissue cells lying in the walls of the breach. Up to the time of the accident they have been leading placid, passive lives, binding loosely together the fibers of the muscle without in any way interfering with their contractile duties. In ordinary circumstances they would have gone on performing this quiet duty all their days, just as their forefathers had done for endless generations before them. With the accident their disposition and mode of life change radically and suddenly. They take on, as it were, a fury of action, change their shape, begin to divide and breed, giving rise to broods of builders which are to mend the gap in the muscle. These builders are not poured out as an undisciplined mob; they proceed as orderly marshalled armies. As quickly as they grow out to fill the gap from the sides of the wound they are accompanied by sprouts from the neighboring capillary vessels and are thus furnished with the means of sustenance. When the debris in the wound has been cleared away and the gap thus filled with a new army of connective tissue units, the units or soldiers begin to change from an active to a passive state; they shrink and form a cicatrix—a mere connective tissue cement. In this way Nature stitches the torn ends of the muscle together. We admit that the surgeon may expose the torn ends of the muscles, clear away the blood and damaged fragments, and stitch the torn ends together, but even when this is done Nature has still her operation to perform, for the only stitches which ultimately hold are those inserted by those extraordinary cobblers—the connective-tissue cells. What rouses these armies of menders to action we do not know. The power to heal is one of the marvels with which living tissues have been endowed. Unless it were so the surgeon would necessarily be a mere cobbler. All we do know is that these living units can do their work unaided by any human agency, but we also know we can hinder them as well as help them. Long ago Ambrose Paré put the matter in a nutshell when he said: "I dressed the wound; God healed it."

The art of healing lies, then, not in knowing how we can heal the human body, but in knowing how we can help the living units of the body to perform

this task for us. We have to study and know the habits and proclivities of these microscopic healing units of the body just as closely and well as we watch and note the ways and weaknesses of our best friends. We cannot watch those indispensable healing assistants too closely. John Hunter knew that. Every time he discovered a wound and saw the red granulation tissue building up the gap in the flesh he studied it as a gardener does his most precious bud. He saw that the healing tissue must have quiet and comfort in which to do its work. Think for a half a minute what progress you would make in mending a rent in your skirt if some restless terrier kept tugging at the hem. Your stitches would be ripped out almost as soon as you had tightened them. Think, then, of the uphill task that confronts the armies of cells which are trying to make good a tear or rupture in a muscle, if that muscle continues to be thrown into action. Nature has foreseen their difficulties and throws the muscle out of action. Hunter observed that if a muscle or tendon was ruptured the patient ceased to have the power to call it into action. At a later stage action and massage may become necessary, but of that we shall speak later on. It was long after Hunter's time that Pasteur and Lister discovered microorganisms to be the chief enemies of the healing units. If such enemies can be excluded from the body the armies of healing tissue can proceed quietly about their work of mending; if they are not protected from these invaders they have to fight as well as build. It is like reaping a field of corn with most of the reapers serving as policemen. In this way surgeons greatly improved the art of healing by discovering simply why in some cases the real healers of the body were hindered in their work. Then other discoveries led on to further improvements in the art. It is a discovery of ancient times that the human body, after an attack of smallpox, was immune henceforth from this disease. Jenner found out that he could produce an immunity by vaccinating the body with the lymph of cow-pox. Then later we came to understand that the body of anyone attacked by a contagious or infectious disease was the scene of a widespread and terrific battle invading hosts of microorganisms and defensive mobile armies represented by the white corpuscles of the blood. At first the physician could do little more than look on and pray for the defenders to have the best of the fight, but by patient and continued observation he is learning how to strengthen the defenders by the use of vaccines, antitoxins, and other methods of our modern serum therapy. Here, again, the medical man is not really the healer; that power is inherent in the patient's blood and body; all he can do is to supply such conditions as are within his reach which will give victory to the defensive armies of the body. The best a physician can do is only to hold the lamp while Nature does the mending. But if he knows how to hold it rightly he may well make all the difference in the ultimate results, the difference between recovery and health.

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ORIGINAL ARTICLES

AN ORTHODONTIC APPLIANCE, BEING A COMBINATION OF PRINCIPLES INVOLVED IN THE LINGUAL APPLI- ANCE, RIBBON ARCH AND EXPANSION ARCH

BY H. C. POLLOCK, D.D.S., ST. LOUIS, MO.

TO bend a wire to conform to the dental arch and teeth as they stand in malocclusion, then to gradually straighten or lengthen this wire from time to time as the teeth are moved in conformity with the wire, is a principle which in the past few years has been very much advocated and seems to have gained no small amount of popularity in the various designs of orthodontic appliances.

A slow, gentle, constant pressure made to bear continuously upon the teeth in the direction in which it is desired they should be moved, as advocated by Angle and others, has seemed to be much more desired than any form of intermittent force. Both practically and theoretically, it seems entirely agreed that this type of force applied to the teeth in orthodontic treatment must now be practiced if results are to be obtained within a reasonably short period of time and if the patient is to be released of many of the defects of former methods of orthodontic technic and treatment. Still another qualification which has seemed to be equally desirable in orthodontic appliances is that of inconspicuousness and cleanliness.

Because the appliance about to be described, seems to have qualified in a measure at least in all of the above specifications, as well as in many other characteristics of merit, I have been asked to describe it and its application in the treatment of cases.

The appliance is composed of the following members (Fig. 1): base wire (*b*), auxiliary wire (*h*), labial wire (*a*) as the basic members of the appliance. In addition to these, are ferrules on the auxiliary wire (*g*), small ligature wires or grass line (*d*), and loop (*e*) as a section of the labial wire.

The base wire (*b*) is made of a rather stiff or rigid material which will retain its rigidity after being heated, a material which can be successfully adjusted by the wire-pinching process (after Lourie). Ten per cent iridio-platinum is ideal; however, Ney Oro may be used or a number of the different precious metal combinations manufactured for orthodontic purposes. If a base metal wire is used, it must be one the temper of which is not obliterated by heating, as both ends of the base wire (*b*) are soldered to the lingual surfaces of the molar bands. The base wire (*b*) is adjusted and bent to the cast in such a way that it lies very close to the soft tissues, still allowing sufficient room under it to permit of proper cleansing process, as well as ample space and area exposed for operating the wire-pinching processes which may be desired in the molar and second bicuspid region. By joining the two molar bands as it does, the wire serves the purpose of stabilizing the whole appliance, in addition to securing

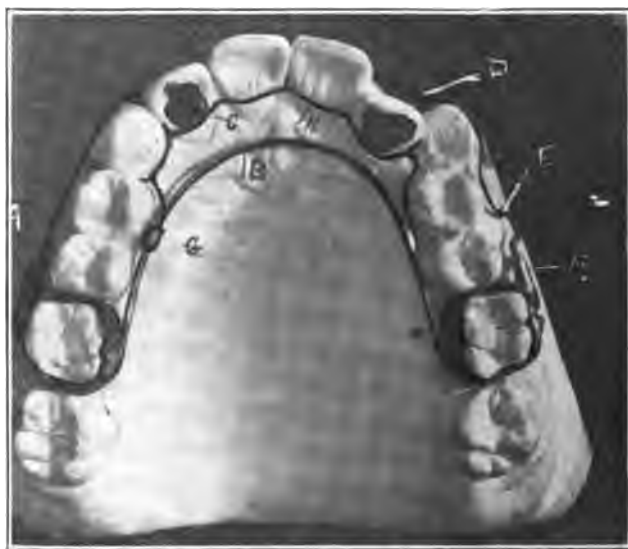


Fig. 1.—*A*. Labial wire. *B*. Base wire. *H*. Auxiliary wire. *D*. Small-ligature wire. *E*. Loop in labial wire. *F*. Buccal tube. (Appliance described in text.)

stationary anchorage of the molar or anchor teeth. The wire, of course, may be either expanded or contracted, tilted or torqued by the wire-pinching process which has previously been described by Lourie, Dewey, and Mershon and should be made of not less than 19 or more than 16 gauge Brown and Sharp. A removable attachment for securing the wire to the molar bands is not required, as the bulk of the adjustment comes from the labial wire.

The auxiliary wire (*h*) is a very soft, flexible, annealed wire which may be easily and readily adapted to the lingual surfaces of the teeth; in fact, burished to the teeth on a plaster cast if so desired. I use a soft gold alloy wire; however, annealed nickel silver or base metal wire might be successfully employed for the same purpose, if it were not for its extremely corrosive and unclean properties in the mouth. One end of this auxiliary wire (*h*) should be securely soldered to the base wire (*b*) as in Fig. 1, while the opposite end is attached to a ferrule, which in turn slides easily on the base wire (*b*). The fer-

rule sliding easily on the base wire (*b*) enables wire (*h*) to be free to follow the teeth in any direction or position they may be moved. In order to make the auxiliary wire (*h*) secure from upward and downward movements in the front of the mouth, two small bands may be placed on the anterior teeth, as desired, with lugs or spurs on their lingual surfaces, which spurs will hold securely the auxiliary wire in any position required.

If it is desired to eliminate the conspicuous appearance of the anterior bands, the same effect may be secured by the use of copper cement on the lingual surfaces of the teeth, the cement notched exactly to retain the auxiliary wire, thus serving the same purpose successfully as if the teeth were banded. It has been my custom to use gelatin strips, tightly drawn about the tooth, after the soft copper cement has been placed upon the lingual surface. This enables the cement to set securely without being distorted. It then becomes amply rigid and secure to retain its grip on the lingual surface of the tooth indefinitely. This latter



Fig. 2.—Same as Fig. 1. Appliance adjusted to a lower arch.

process assists to eliminate some of the criticisms of copper cement when used for spurs and lugs.

The labial wire (*a*) is the usual form of loop labial wire; however, if made of rigid material, it can be used successfully in gauges as small as 20 or 21 B. & S. The mesio-distal adjustment is manipulated entirely by means of the lengthening and shortening of the loop springs. The buccal tubes engage each end of the labial wire, which, when well fitted and in place, make of it a long flexible spring wire, being an ideal means of securing pressure to apply to the teeth. The labial wire (*a*) may or may not be secured by means of attachment to the anterior teeth, depending entirely upon the movement to be desired and the preference of the operator. By making secure attachment to the bands on the anterior teeth, however, some of the advantages of the root-moving forms of appliances may be secured. The molar or anchor teeth may be tipped by manipulation of the labial wire in conjunction with the pinching of the base wire, in order to secure opening of the bite, as may be desired.

By means of ligating wire *a* to auxiliary wire *h*, pressure may be gained against the lingual surfaces of the teeth at any point or region. Inasmuch as the labial wire is a flexible spring wire, the ligature may be placed about it rea-

sonably tight, and the pressure will then be exerted constantly against the teeth by means of the auxiliary wire *h* until the teeth move sufficiently to release the pressure. Another advantage is the use of ligatures. The ligature is not placed about or around the tooth, but, instead, passes between the teeth through the embrasure. This method eliminates many of the objectionable features to a



A



B

Fig. 3.—(A) Appliance adjusted June 5, 1920. (B) September 5, 1920. Appliance operating during the greater part of July and also of August without adjustment.

ligature wire or grass line, particularly as the ligatures do not come off and are not constantly manipulated by the finger of the patient, in this way coming loose and causing annoyance and difficulties. Ligatures of rubber may also be employed—a matter of preference to the operator.

Plain anchor bands are used, being made of a strong and substantial band material. Much care should be taken in the construction of molar bands, they must be strong and durable, and able to withstand the stress of mastication over a period of time, as they are a part of the unit appliance. The appliance is made entirely on the model, impressions being taken with the molar bands fitted to the teeth in the mouth, impression removed, and the molar bands then transferred to the impression and waxed into their proper positions.

Fig. 2 shows the appliance fitted to the lower arch with auxiliary wire closely adapted to the teeth. The most outstanding feature of this appliance is its constant perseverance in moving teeth without frequent adjustment and also the rapidity with which teeth can be made to assume their normal relations in the arch, as the force is constant and not intermittent.

In cases of canine teeth in labial occlusion, it may be desired sometimes to

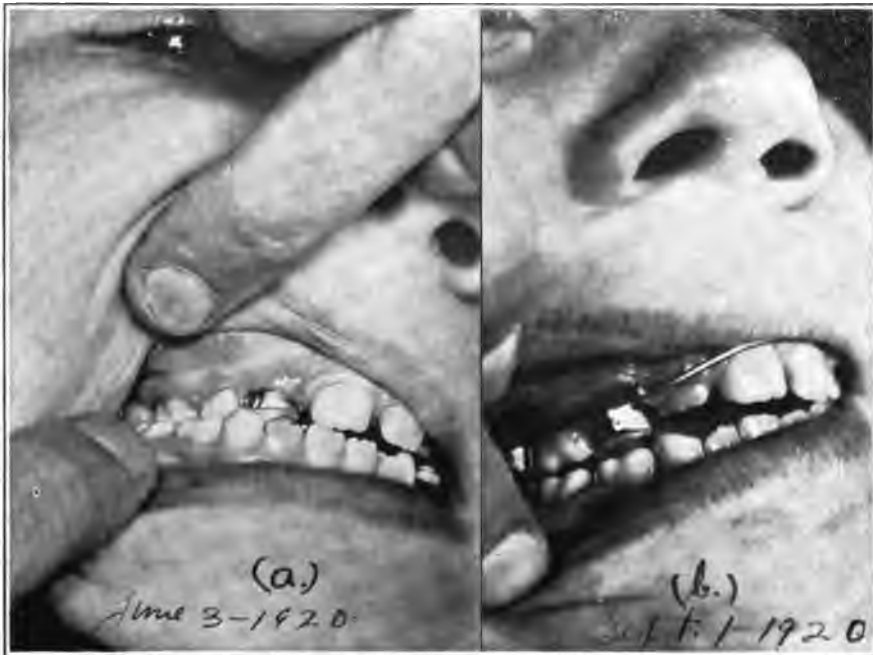


Fig. 4.—(a) June 3, 1920. (b) On September 1, 1920. Appliance receiving two adjustments after being set to place. Case not in normal occlusion as yet, but entirely shifted over the lower teeth.

shift the adjustment loops in the labial wire from the usual position, just in front of the buccal tubes, to a point just over the canine, thus enabling the loop to bring pressure upon the prominent canine tooth. In all cases where it is urgent to use a Baker anchorage, hooks and attachments for the convenience of placing the rubber bands may be placed just the same as with any other appliance. The Baker anchorage, however, adds to the rapidity of tooth movement as a result of the added energy transmitted by the elastics.

In order to illustrate the question of efficiency, a recent case is presented as it appeared June 1, 1920 (Fig. 3). Appliances were immediately set to place and after several adjustments the patient left for the summer months. The patient next appeared September 5th when the photograph shown in Fig. 4 was

taken. This illustrates the progress of the appliance in providing space for the malposed canine. Ample space was provided by September 5th, but as the appliance received no adjustments during the summer months, no pressure had been brought to bear in order to bring the canine into its proper occlusion or in the downward directions.

Fig. 4-A shows a case as it appeared June 3, 1920; Fig. 4-B, September 1, 1920. All of upper buccal teeth on the right side were originally in lingual oc-



Fig. 5.—Appliance in place.

clusion. By placing a small amount of lateral tension in the labial arch wire, at the same time attaching auxiliary lingual wire to the arch wire by means of a wire ligature at a point immediately anterior to the deciduous canine, pressure was made to bear constantly upon this side which soon shifted the side as shown in Fig. 4-B, patient making two visits for adjustment after appliance was set to place.

Another type of case is shown in Fig. 5, in which tremendous expansion of the upper dental arch is desired. I have found the type of appliance used in this case to be the most effective, because the force extended is constant and at the same time gentle, stimulating bone growth very rapidly.

A SUBSTITUTE FOR PRECIOUS METALS IN THE ENLARGEMENT OF THE ALVEOLAR PROCESS BY THE LINGUAL WIRE

BY DR. R. ANEMA, PARIS, FRANCE

THE accompanying illustration shows a wire nipped and indented by means of Lourie's wire-stretching pliers. I have used the wire for enlarging the inferior alveolar process of an eight-year-old boy. The special feature of the wire is that it is made neither of iridio-platinum, nor of elastic gold, but of the nonprecious metal nichrom. It may also be made of hard German silver. If I

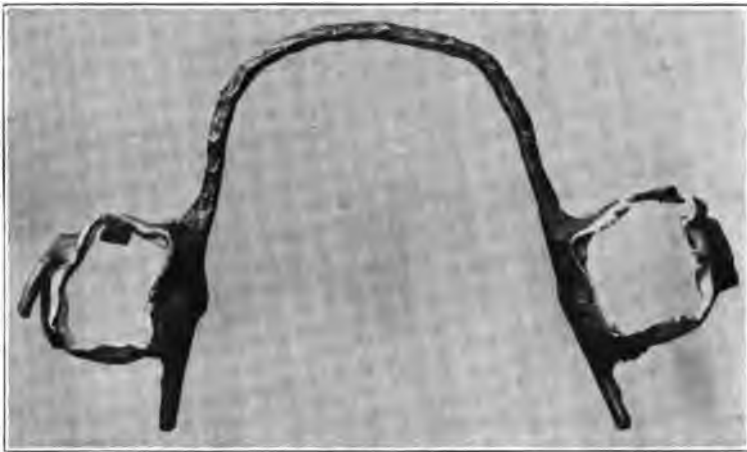


Fig. 1.—Lingual arch (twice natural size) of nichrom soldered to the bands by pure tin and stretched by means of Lourie's wire stretching pliers. This wire produced an expansion in the canine and incisor region of about three millimeters.

am not mistaken, it was Case who first gave the profession a means of obtaining very hard German silver by drawing it cold through the draw plate.

Instead of soldering the wire with silver or gold, which would diminish its elasticity, I soldered it with tin and in this way was able to maintain the elasticity unimpaired. As a matter of fact, soldering with tin, if carefully done, does not lessen the elasticity of the wire, as Angle already demonstrated in soldering his "arch hooks" to the alignment wire made of nickel silver. The tin soldering must, of course, be carried out with all requisite precautions to cleanliness, care being taken to give a certain thickness to the tin solder, or even pure tin, that may be used, though the latter requires a higher temperature. A considerable mass of tin solder or tin must be used, otherwise on nipping the wire with the pliers, it may become detached from the band.

The wire shown in the illustration has been indented in some twenty places and I was able to enlarge the alveolar process in the region of the canines and incisors by about three millimeters. The case in question is one that falls in Class II, Division 1 (Angle's classification).

The use of nonprecious metal for the wire employed in the enlargement of the alveolar process by Lourie's method is of considerable importance at the present time in France owing to the fact that iridio-platinum now (May, 1920) costs sixty francs a gram.

I should like to conclude this brief technical description by offering a suggestion of a general nature. Could not the "nouveaux riches" both in Europe and in America be urged to insist less on having their jewels mounted in platinum!—for no doubt you have as many "new-rich" in America as we have on this side of the Atlantic. I remember that during my first visit to the United States some twenty years ago I was somewhat surprised to hear a negro insist on having a perfectly sound tooth replaced by an all gold crown. The negro, doubtless a "nouveau riche" of those days, wanted to have gold in his mouth just like his white brother. He could not be made to understand that gold had been used for the white man's teeth not through luxury but of necessity. May the "nouveaux riches" of these days, in Europe as well as in America, show a clearer understanding of their after-war duty by leaving platinum for the more urgent needs of orthodontists and dentists.

Owing to the exceedingly high cost of the precious metals at the present (not all our patients are millionaires), I thought it might be of interest to the reader of *THE INTERNATIONAL JOURNAL OF ORTHODONTIA*, to mention a method of using a nonprecious wire soldered to the bands with tin, which I have found useful in various cases. Tin, as is well known, causes no inconvenience in the mouth, neither is it detrimental to the health. It is true that it slightly discolors the surrounding teeth, but such discoloration is easily removed.

ARRESTED VERTICAL DEVELOPMENT

BY DR. ROBERT DUNN, SAN FRANCISCO, CAL.

IN the course of the preparation of this paper it became quite evident that the subject of Arrested Vertical Development was of such magnitude, being associated, as it is, to a greater or less degree, with almost all cases of malocclusion of the teeth, that a more extensive knowledge of the subject of anthropology and biology was necessary than the limited time and available material at my disposal would permit.

Therefore to present the matter for your consideration at this time in little more than, may I say, a tentative way, would be a mistake, and I will defer the more thorough or analytical treatment of the subject to some future time or until the obtaining of necessary material will be less difficult.

In using the term "Arrested Vertical Development" I refer to the conditions found in the molar and premolar regions, that produce what is commonly known as an excessive overbite. For the present at least, we will divide arrested vertical development into three classes:

1. Arrested vertical development in molar and premolar region, associated with the great class of irregularity of teeth known as Class I. It is here the condition frequently exists only to a minor degree, and when such is the case, it is usually overlooked, resulting in much embarrassment to the operator.

2. Class II arrested vertical development in molar and premolar region, associated with that type of irregularity known as Division 1, Class II. Here it is easily recognized, often existing in the extreme, and not infrequently unconquerable.

3. Arrested vertical development in molar and premolar region associated with that type of irregularity known as Division 2, Class II. Here the condition, as in Division 1, Class II, is easily recognized, differing from that found in other types of classification in that it is more easily controlled.

In looking through the mass of orthodontia literature it became quite plain that arrested vertical development in the molar and premolar region, as a vital factor in producing malocclusion of the teeth, has not fully dawned upon the orthodontia profession, and in the failure to recognize this all-important factor and what constitutes normal vertical development in a given case, lies the cause of a very large percentage of that great number of failures that confront the profession.

Pullen of Buffalo, in his article, "Control of the Over-bite of Class II Cases," read before the Panama Pacific Dental Congress, places considerable emphasis upon its importance, and states, "All too often have cases of malocclusion been treated in which the abnormal vertical overbite has been overlooked or regarded as an irremediable typal defect with the result that the most important factor of

*Read before the Pacific Coast Society of Orthodontists, San Francisco, Cal., Feb. 16, 1920.

the malocclusion has remained untreated," and may I add, more frequently have cases been treated wherein the orthodontist believes he has overcome such discrepancies which may have existed as to the proper vertical development, but which in reality, he has not, and later, when the teeth begin to revert somewhat to their former malposition, he places, for the want of a better reason, the cause of the reversion, upon the influence of the developing unerupted or erupting molars. More particularly is this true in cases of Class II.

The questions that present themselves most forcibly as to the subject are: What is the cause, and how are we to determine what is the normal vertical development in molar and premolar region in a given case? What is the most effective way to establish the normal vertical condition when absent; and the all-important, how are we to maintain this vertical rearrangement when once obtained, resisting those forces of occlusion that tend to cause a reversion to former conditions before nature can produce that development necessary for its permanent maintenance?

As to the etiology, that still remains a little obscure, everything pointing, however, to the lack of proper extrinsic stimuli rather than to any intrinsic stimuli, and it is the belief of the writer, that it will, on a more thorough investigation and analysis, be found that arrested vertical development is not a result of factors usually attributed as causes of malocclusion of the teeth, but it is in itself a most potent factor, the various types of malocclusions taking their form through the influence of contributing factors, many of which are but perverted normal forces acting as such because of the arrested vertical development.

How are we to determine what is the proper vertical development in a given case? This like the former question, is not yet definitely settled. Bonwell and others state that the normal overbite in incisor and cuspid region is governed by the depth of cusps of molars and premolars, the length of cusps varying in different types of individuals. This rule, while probably efficacious in the making of artificial dentures, will not, I believe, be found sufficiently practical for the determining of just what is the proper overbite in cases we are called upon to treat, and must be either enlarged upon, or some other means evolved for its determination. In the meantime the best that we can do is to endeavor to establish through mechanical appliances such vertical rearrangement as in our opinion will approximate the normal, then select such retaining appliances as will, with occasional changes, permit nature to adjust any slight discrepancy that may then exist.

If in the use of engineering principles or other methods of predetermining arch form, this vertical development in molar and premolar, is not fully considered and provided for, such principles or methods will be of little practical value. For it is by utilizing variations in this development as well as changes in arch form that enables nature to adopt one particular type or form of tooth to the various types of individuals.

Dr. James McCoy, in his paper on "Predetermination of Arch Form" read before this Society at its last meeting, demonstrated conclusively that nature can and does select one size of type of tooth and adapt it in harmony to a wide

variation in type of individuals; not through the forming of the arch alone, as some believe, but mainly through changes in vertical arrangement.

This now brings us to the question as to the most effective way in establishing and maintaining normal vertical development. In those extreme cases, where the deciduous teeth are still intact, even where the permanent incisors are in a partially erupted stage and the first permanent molars have not as yet erupted to full occlusal contact, the crowning of the deciduous molars has, in the writers experience, proved quite effective. It is assumed, of course, that the absorption of the deciduous molar roots has not progressed to the extent that this procedure would be impracticable.

Care must be exercised in seeing that the so-called "opening of the bite" is done gradually, for in those cases where this was not observed and the bite or occlusion was opened to the full extent desired all at one time, there apparently occurred an overstimulation in the deciduous molar region, resulting in a retarding of vertical development and the eruption of permanent premolars, extending over an unusually long period of time.

This gradual change is best brought about by first crowning the lower first deciduous molars, using material of about thirty to thirty-one guage. Then after the lapse of several months or longer, the upper deciduous molars may likewise be crowned, following still later, if this is not sufficient, by either making new crowns for the lower, with thicker cusps, or carefully removing the old ones and recementing, using sufficient cement to permit of the crown being replaced to a position a little more elevated than formerly. These crowns should be permitted to remain during the period of retention of the deciduous molars. If desired, regulating appliances may be attached to the crowns, *but in no case* must the first *permanent* molars be used at this stage, in these particular cases, as an anchorage for appliance, for to do so would only mean a counteraction to that desired.

In cases where the eruption of the permanent teeth is further advanced, it is quite obvious that the molars and premolars (if the latter have erupted) must be elevated. This will necessitate the use of the permanent incisors and cuspids, when the latter are in position, as a resisting force. As we have the forces of occlusion to combat as well as such resistance as the molars and premolars in themselves will exert, it will readily be seen that there will be a considerable displacement of the incisors unless we have those teeth, and molars as well, under complete control.

The selection of an appliance in the treatment of these particular cases that will permit of this control is most essential and I know of none that will fill the requirement so well as the ribbon arch appliance. In the process of elevating the molars and premolars the incisors and cuspids will be depressed in their sockets; this is unavoidable, in fact, it is desirable, for these teeth will invariably return to their former vertical positions, which is usually normal, and it is the utilizing of this force of the returning teeth that will prove so beneficial in the stimulating and stabilizing of normal vertical development in the molar and premolar region. With this requirement in mind, it will be seen that the selection of effective retainers is as important, if not more important, than the selection of suitable regulating appliances.

After many years of experience in the use of various principles in retaining appliances, as bite plates, incline planes, lingual arches with skeleton incline planes attached, etc., I have come back to the use, after retrials and discards, but with some refinements in construction, to the lingual incline plane as evolved by Rogers of Boston. Great care must be observed as to the details in the construction of this appliance, for if this is not done, it may prove more of a menace than a benefit. At no time must it be depended upon to maintain mesio-distal relation of the arches. Where this latter condition has been a feature of the case, that must be developed and maintained through the labial arch and intermaxillary ligatures. This is very important, for intermaxillary ligatures must not be attached to the incisor bands, or for that matter, directly to any of the upper teeth. The width of the inclined plane should be only sufficient to easily engage lower incisors, bulk being avoided, as it only serves to interfere with the speech and proper prophylaxis. This little retaining appliance, if intelligently constructed and worn for a sufficient length of time, will help very materially in bringing to a successful conclusion many trying cases.

DISCUSSION

Dr. B. Frank Gray, San Francisco, Cal.—Dr. Dunn has written on a subject which has interested me for a good many years. It seems to me we paid little attention to this matter of the so-called vertical "overbite" or lack of vertical development in the early days of the specialty of orthodontia. I recall in the treatment of certain Division 1, Class II cases of malocclusion where the supra-occlusion in the incisor region was marked that presently during the course of the treatment this condition was greatly reduced. Of course, the use of the intermaxillary elastics had a tendency to stimulate the vertical development of the molars—particularly the lower first molars in such cases.

I quite agree with Dr. Dunn that even to this day this condition is frequently overlooked; at least there is far too little attention paid to it. Certainly I would expect nothing but failure in the treatment of many cases if I did not bring about an increase of vertical development in the premolar and molar region. The doctor makes a good point in suggesting the arrested vertical development "is not a result of factors usually attributed as causes of malocclusion of the teeth but is in itself a most potent factor" in the cause of malocclusion. I believe there can be no doubt of the truth of that statement. We are dealing in many cases with a real cause of malocclusion, therefore, and should direct our efforts to the overcoming of this condition.

Intermaxillary elastics, vulcanite bite-plates, the bite-plates soldered to incisor bands, the lingual arch carrying bite-plates, the ribbon arch mechanism, crowning of deciduous molars—all of these and more have been used to bring about the correction of this lack of vertical development in the premolar and molar region. I think I have tried pretty nearly all the methods noted with varying success. I am glad to say that I have never had more splendid results than in some cases where the Angle ribbon arch has been used. In treating some of the younger children it seems to me a very nice appliance is the removable lingual arch to which has been soldered a suitable plane or plate for receiving the impact of the lower incisors. If desired an additional support may be had through the use of bands on the incisors or the long spurs to engage the cutting edge of these teeth.

I am sure Dr. Dunn is not overcautious in the matter of opening the bite gradually. It must be realized that through haste we can defeat the object sought, causing possibly the premature absorption of the roots of the deciduous molars in cases where they have been banded or crowned.

Dr. J. V. Mershon, Philadelphia, Pa.—In Philadelphia we had an old judge who said some men talked a couple of hours about something they knew nothing of, and his limit was a half hour. I am afraid my limit is less than half. I do not know much about this

subject. I agree with Dr. Gray that the profession has noticed it and has not had the courage to tackle it. I am glad Dr. Dunn has considered this matter of a lack of vertical development. It is a developmental problem. There is no use of going into the question of whether we all noticed it or not. We cannot help noticing the thing that gives as much trouble as this failure of vertical development of the molar teeth. Really whether it is a lack of development in the distal region or overdevelopment in the anterior region I do not know, and do not know how to find out, but we know there is that lack of symmetry there, and again we know that in undertaking to treat this condition no two cases are alike. Some come along beautifully, and others, baffle us in spite of all our ingenuity. But again our correction is the result of a process of stimulation and again I want to call your attention to a difference I shall try to make, and do not know how to do it! I am not sufficiently skillful in the use of words to be able clearly to differentiate as between a stimulus and a force. Now whether we can have a stimulus without force, I do not know. But all stimuli are not mechanical stimuli. We can have a chemical stimulus. We may have a stimulus from heat, from cold, and in many other ways. I do not know whether you have all looked through a microscope, and in the center of the field have seen a single cell animal, swimming about over the field, and then over here on your glass you place a little drop of iodine and it creeps over and over, and the motions of the animal become more jerky and rapid, and then it slows up and is dead! There is the result of a stimulus to a single cell. At first the stimulus increases the activity (the mechanical reaction of the iodine) of the cell, but it becomes over stimulated and finally dies. If you put your foot on the same animal on a hard floor it would be a stimulus, but it would cause instant death of the animal. In moving teeth, all we want is that stimulus. Quoting from Conklin, as I read in my paper, in treating our cases protoplasm has that peculiar quality of receiving this stimulus and storing it up for a long time and reacting for a long time. The point I wish to emphasize is, beware of too much pressure on your teeth.

Coming back to this problem of—to use a vulgar term—"opening the bite" my experience has probably been the same as that of everyone else. If anyone can show me any way I have not tried I would like to see it, and I have failed with all of the methods. But I believe it is a physiological condition and not a mechanical condition we are trying to overcome. My procedure in a large percentage of my own cases is first to produce what we call harmony in the size of the dental arches. I forget the overbite. I treat certain Class II cases as Class I cases—disregarding everything except—the general arch formation. We are producing a stimulus to those teeth. There is always an effort on the part of nature to revert to the original plan, and it is astonishing that in a reasonable percentage of those cases we get that vertical development. Not in all of them, but in a lot of them. One child will develop at eighteen, where another takes longer. Again, we are not good waiters!

In a Class I case in which the upper teeth were markedly protruded, with abnormal lip function—the lower arch very symmetrical (the change being made by the uppers being moved out entirely) with lower teeth biting up against the soft tissues,—contrary to my best judgment I simply put on a labial arch such as Lourie uses, with the fingers coming down to restore the anterior teeth and overcome the abnormal function of the lip, and to my surprise that was all that was required. I had the courage of my convictions and waited for two years and have not touched the case since.

So it seems to be a question of stimuli, irrespective of our methods. Sometimes the stimulus of expansion or general correction which largely is in the bicuspid and cuspid region—is sufficient.

In Dr. Johnston's article in the November *Dental Cosmos* where he recorded the effect of the involuntary tongue muscles, he has shown a certain type of case in which he has never been able to secure retention. He has not come to any conclusions, but simply states facts. I hope that article may be of some assistance in our troubles. But whether it is a lack of vertical development, or whatever it is, it is all a matter of development, and we have the same trouble in retaining our cases.

Dr. Cavanagh, Portland, Oregon.—It seems to me that in the application of force to the crowns of those temporary molars to "open the bite" we are apt to get stimulation where we

do not want it; or we may get depression there by putting all the force of mastication on those molars.

In the use of the bite-plate attached to the anterior teeth (to which I have resorted to quite an extent) may we not get sufficient stimulation to cause an abnormal absorption of tissue in the region of the lower incisors? An overstimulation, in my belief, is as detrimental—and more so—than an understimulation. The problem of getting the right amount of stimulation to produce just the proper result is a very touchy one. I have caused absorption in the process of the lower anterior teeth by the use of the bite plate, placing all the strain on the anterior teeth and awaiting the development that must take place in the molar region while the first molar is erupting. I had the idea that if I retained those anterior teeth in the manner which I think is approximately right, until those permanent molars have erupted fully, probably the removal then of my bite-plate should permit the bicuspid to erupt to their full length (as we may say). I have been disappointed in some cases, as on removing the bite-plate there was a return of the abnormal overbite—either that or a resorption in the region of the molars or premolars. I think we have not given enough thought to these matters to make definite statements. I have seen the results of crowns on temporary molars, left for a year or more, and the result was just as unsatisfactory. I can offer no satisfactory solution.

Dr. Scott, San Francisco.—What I will have to say is more the result of observation than of experience. You have noticed that in the deciduous arches before the permanent teeth are in place, the arch is practically a horizontal, flat plane. I think that accounts for the fact these cases are very apt to appear normal in development at the age of three or four, and this plane being flat, it is very easy for the teeth to drift into distal occlusion—Class II, or mesial occlusion Class III. Nature has provided a way to develop the compensating curve. I think it is done in this way. In the ordinary circumstances, the lower first molars erupt about the age of six years, and the lower one almost invariably takes its position first. You still have, to all intents and purposes, a flat plane, but when the bicuspid erupt, they erupt with enough force—enough stimulus, to lift the deciduous molars from their normal positions, which allows an additional space occlusally between the two permanent molars (upper and lower.) Now these permanent molars will erupt additionally until they come in contact with one another—which opens the bite, and there your vertical development takes place in a normal case. That is the result of my observation. I have not read it or seen it in print. I think that is the way Nature brings about the development of the Curve of Spee. In the Forsyth Infirmary in the examination of forty thousand children, 95 per cent of the children at the age of three years are developing normally from the dental standpoint. In all probability some of them are not developing normally, abnormalities likely being overlooked. At the age of twelve, 95 per cent of them were abnormal. Anyway, according to their data, all of our trouble occurs between the age of three and twelve years.

Dr. James D. McCoy, Los Angeles, Cal.—Those of us attending the meeting of the San Francisco District Dental Society the other night were interested in the report of Dr. Alvarez concerning rickets, etc., and diseases characterized by faulty bone formation. According to a report read by the Doctor, the factor of exercise seemed to play an important part. Children brought up under improper conditions in the cities seemed to develop rickets, or other troubles. Those living in the country, where given an abundance of fresh air and exercise, seemed less predisposed to this trouble. His mention of the fact that this condition was least prevalent in Australia, had an important bearing when we consider that Australia is a ranching country. It is not an empire of cities, but a great agricultural country.

When we stop to consider the question of vertical development, it seems to me the factor of normal use and dis-use must play an important part. I believe if we place the teeth in their normal relation, where they can function—if we have used the proper means—this will cease to be the great problem that it has been in the past. I think we all realize we must in the future consider mechanical force with a great deal more caution than in the past, so that we may classify the means of moving teeth as (1) developmental force

or a physiologic force applied to the teeth (2) a traumatic force—i.e., a force which would result in overstimulation where teeth are moved too rapidly. If we can move all the teeth to approximately normal relation by mechanical means of such character that it will constitute a physiologic process, I believe under that stimulation, and on the restoration of the teeth to positions, where they may receive the stimulation of other functions which they would naturally get—that under such conditions this will cease to be as great a problem as at present.

I was interested in talking with Dr. Gilpatrick, whose method of arch determination you will remember. His method is based on placing the teeth in the arch in such manner they will be able to perform all the motions of occlusion—his methods being similar to those of the prosthodontist. He made the statement that in creating such an arch, where all the acts of occlusion can be performed, "I find the question of lack of vertical development has ceased to be as great a factor as it used to be." I think that is worthy of our careful thought.

Dr. McCowan, Palo Alto, Cal.—I am very glad the meeting has taken this turn because I think we have had practically all the different appliances. I believe we have enough appliances with which to do the work, if it has to be done. The principal thing is to get patients in the proper physical condition. Proper exercises, proper food and let us get these little patients nourished so they can profit by the work we are doing for them. I was for a number of years, in gymnasium work, and saw the benefits of getting little patients in good physical condition. Many of these troubles, spinal curvature, etc., are cured by proper muscular exercises. So by toning up the muscles of the face, putting the children in good physical condition, we correct or help many of these troubles. I believe it is proper to widen the arches and then do what we can to put the child in good physical condition. That work is neglected to a great extent, but if we would advise the treatment of these children in that way it would help a great deal.

Dr. Moorhouse, Spokane, Wash.—I was very glad to hear Dr. Dunn's paper. I feel we have a wrong impression, and have been making a wrong diagnosis of this so-called overbite calling it a lack of vertical development. I say this after observing Dr. Ketcham's method of treatment, and from my own success. Some practice the method of depressing the incisors—especially the upper ones, to overcome this overbite, feeling the condition is due to an overdevelopment of the premaxillary bones rather than an underdeveloped condition of the alveolar process in the region of the molars and bicusps. I do not know if I grasped just what Dr. McCoy said as to the prosthetic phase, but I have followed this principle in treatment—especially in Class II, Division 1 cases. I study the facial appearance of the patient. We see lots of people with artificial dentures and it is obvious the teeth were set too short: the lips close down together in a manner that shows unpleasing outlines. In many cases of malocclusion you will observe a lack of development in the molar and premolar region, which means you must have a stimulation and development of that region, and a strictly open-bite treatment. But if you find when the lips are perfectly passive and they show none of that open appearance, the question then is one of overdevelopment in the premaxillary region, or possibly both in the premaxillary region and in the alveolar region of the lower incisors, which indicates the depression of the incisors of one or both arches.

I think we have overestimated the idea of atmospheric pressure from a mechanical standpoint. So far as the proper treatment is concerned, I think there are two considerations: the proper development and proper holding of the muscles of the face and of mastication. And I would add to that the proper oxygenation of the blood where you get food for the development or growth of any tissue—and that is necessary in the development of any part of the body—not alone the jaws. If it helps all parts of the body it is not simply atmospheric pressure assisting the jaws.

Dr. Reed, Long Beach, Cal.—As to Class II, Division 1 cases, we not only fail to have sufficient development of the alveolar process, but also of the superior maxillary bone. In expansion we produce lateral development of the maxillary bone and increase the sinus development. Not only that, but in getting our lateral development, I think we stimulate

growth and get downward development of the superior maxillary bone. Frequently where these cases are long neglected, we have a deflection of the septum, while if corrected earlier we get that downward growth and the septum is allowed to straighten out.

Dr. Robert Dunn, (closing discussion).—I am satisfied I have created some disturbance anyhow! I still maintain that arrested vertical development has a great deal to do in producing many cases of irregularity of teeth. We do not always recognize it, however, and as Dr. Merzhon says, we may have established a sufficient degree of that development in some instances where it existed and do not know it! I also maintain that the incisors are almost always normal as to vertical development. There are exceptions, of course, but in a large percentage of cases they are normal and when depressing them you would have to hold them a mighty long time after treatment if you do not expect them to go back to their normal position.

This thing of depending upon children of today to follow out muscular exercises in the hope of establishing normal vertical development in molar and premolar region is all talk and foolishness. True, proper muscular exercise may have a great deal of influence, but that work must be started very early in life to be of much benefit.

As to the use of small crowns, you will notice I stated you must be very careful in their use and not "open the bite" too rapidly. Use them as a stimulus. The purpose of the deciduous teeth is not only the mastication of food, but for the stimulation of the growth of the first permanent molars and the premolars that are to follow, and if you will observe this development through the aid of the x-ray you will note this growth taking place from year to year and such observation may be of value. What we want to do is to stimulate the condition through the use of these little crowns, but if you get too much force you are liable to produce just what you are trying to overcome. I do not think the first molar at any time acts as a force to open the bite.

THE DENTAL HYGIENIST IN ORTHODONTIC PRACTICE

By H. B. HAMILTON, D.D.S., ITHACA, NEW YORK

DISCUSSING a paper on Oral Prophylaxis by Dr. Nelson at the St. Louis meeting of this Society the writer mentioned the use of the dental hygienist in his practice. A number of the members afterward made inquiries about the hygienist and evinced considerable interest in this aid to our work. The interest then shown is the excuse for this paper.

Ever since orthodontia became a specialty of dentistry there has been more or less controversy between the dentist and the orthodontist as to the effect on the teeth by the wearing of appliances. The dentist has blamed all sorts of injuries to both hard and soft tissues to the wearing of appliances. The orthodontist has claimed that proper appliances can cause no injury.

The orthodontic appliances in themselves, if properly designed, constructed and applied, and with the proper care, can cause no injury, but if any of these factors are at fault, there is undoubtedly danger to the oral tissues.

On the other hand, the orthodontist is constantly finding cavities and imperfections that the dentist overlooks. Unless these are cared for before the orthodontic work is begun, they may later be attributed to the appliance.

We also find the greatest difference in tooth structure and its liability to damage. In some mouths there seems to be almost a complete immunity to caries, while in others it will show evidence on the slightest provocation. There is also the greatest difference in the care which the patient gives to his teeth. Some patients are able to keep their teeth absolutely clean no matter how crude or complicated the appliance is, while others seem unable to keep them in a state that can be said to approach cleanliness, even without appliances. Instruction and continual lecturing will not entirely overcome this fault in all cases.

Before starting a case the mouth should be placed in the best of condition by the family dentist. With the placing of appliances the responsibility for the mouth rests largely on the orthodontist. Prophylactic treatment seems to be the best method of meeting this responsibility. To do this work oneself becomes burdensome, and as the great majority of our patients are school children, it is not always possible to give every patient the prophylactic attention that may be needed, and make necessary adjustments in the appliances for all the patients that have to be cared for out of school hours. It is here that the dental hygienist is of the greatest value, not only in relieving us of this burdensome task, but what is more important in conserving our time.

A dental hygienist is a person licensed by the state to remove stains and accretions from the exposed surfaces of the teeth under the supervision of a practitioner of dentistry, and to teach oral hygiene. The chief effort of the hygienist is to make the teeth clean and to instruct the patient so that he will

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maintain them in a cleanly condition. It is not necessary to go into the technic, but sufficient to say that the hygienist will do this work more thoroughly and efficiently than the average dentist.

Neither is it necessary to go into the subject of the training of the hygienist as the movement is now so well known in the dental profession. It may be said that the course is certainly thorough and that the student gets a large amount of practical experience. The various institutions teaching dental hygienists have orthodontic clinics and it should be and probably is easy for the student to get some actual experience with orthodontic practice. The following quotations from letters from the heads of some of these institutions show that they are alive to the possibilities.

"We give them talks on the need and value of their services to the orthodontist."

"The dental hygienist receives theoretical and practical training in the handling of children, the importance of child hygiene and the effect of any oral abnormality upon the health of the child."

"The dental hygienist receives intensive training in oral prophylaxis."

"She is also instructed as to how to teach children to keep their mouths clean and can give them wash bowl demonstrations in the office."

"She receives lectures in dental anatomy, and in the tooth morphology class must carve a complete set of teeth by hand."

"Lectures on occlusion and malocclusion are given."

"She is given instruction in making and separating models, cleaning appliances and in thorough prophylaxis of the mouths of orthodontic cases."

That this instruction is bearing fruit is proved by the fact that I have had several cases referred to me by our local school hygienist when the family dentist had been negligent or overlooked the malocclusion.

In addition to instruction noted in the above quotations, the hygienist is taught to make an examination of the mouth, to note all defects and abnormalities, and to properly chart such deficiencies. She also receives instruction in x-ray work: something of the machine, the technic of taking the picture, the developing and printing.

In our practice after the preliminary arrangements are made the child is turned over to the hygienist to prepare for the taking of impressions. She takes the child and seats him in the chair and while explaining the procedure endeavors to interest him and gain his confidence. The orthodontist may be able to do this just as successfully as the hygienist, but the latter is oftentimes able to accomplish this quicker and more effectively because a child will usually respond quicker to the efforts of a woman.

Before the bands are fitted and cemented the hygienist can remove the separating wires and thoroughly cleanse the teeth to be banded and the adjoining teeth. Before the appliances are put on she should thoroughly cleanse all of the teeth. After the appliances are in place she should teach the child how to care for the teeth with the appliances on and see that proper care is taken. If proper care is not taken it is her duty to persist in the effort with the child until a reasonable result is obtained.

While the case is in progress and comes in for adjustment it is examined and if necessary to remove the appliance the case may be turned over to the hygienist for the removal and to give the proper prophylactic treatment. During this treatment she should note carefully the condition of the cemented bands, the evidence of beginning cavities, an irritated gum, and if there is anything suspicious to immediately call the attention of the operator to it.

It is not intended that the operator should rely entirely on the hygienist for this, but should in fact look for these conditions at each visit, but the prophylactic work of the hygienist should include all this. Thus she may note something that might be overlooked by the operator as it is of course more easy to observe these things when giving attention to each individual tooth.

While the hygienist is at work on the first case, the operator takes up the second one and gets that under way. By this time the hygienist is through with the first case and the operator returns and replaces the appliance with such adjustments as are necessary. And so on with the other cases.

I do not mean to say that every child receives a prophylactic treatment at every visit. The frequency of the treatment depends on a number of factors such as the amount and nature of the appliance, the care the patient gives to the mouth, the diet of the patient, etc. It is desirable, however, that at every visit the mouth should be looked over and if there is any evidence of neglect at any point it should be corrected and the child's attention called to it. By this constant vigilance possibly more prophylactic work in the aggregate may be done than is absolutely necessary, yet the individual treatments may require only a few minutes and the final results are most desirable. I am sure of this because I have had cases carried over a number of years with very little reparative work done during the period of treatment, while previously the dentist complained that it seemed almost impossible to keep the teeth in repair.

While the foregoing is the most important aid to the orthodontist, there is a great deal of time when patients are not available. Yet between times there are a thousand and one things to be done. Impressions are to be prepared, models to run and separate and also to carve. The hygienist can easily be taught to do them, and if she has any mechanical skill can also be utilized to a more or less extent in the making of appliances.

There are also the books and records as well as the correspondence that may be turned over to the hygienist.

It is unnecessary to refer to the influence of the hygienist in the office and the many little ways in which she can keep things up to a higher standard. Being an operator she may appreciate these things a little better than the average assistant.

I do not know that I can close this paper better than by quoting Dr. Crosby, of New London. "The reason why we could not do without a hygienist is that we are in duty bound to bring the teeth through the period of orthodontic treatment in as good condition as we received them."

DISCUSSION

The President.—The essayist has brought out so many excellent points that we ought to have the subject thoroughly and freely discussed. The subject of hygiene and the

hygienist is one of vital importance to every orthodontist. I will ask Dr. Flesher to open the discussion.

Dr. W. E. Flesher, Oklahoma City, Okla.—In my opinion the matter of prophylaxis in the treatment of many cases of orthodontia is equally as important as the correction of the malocclusion. In a large practice I hardly see how an orthodontist himself can take care of these cases as they should be. I do not have an oral hygienist in my office, but I can readily see the need of one. The oral hygienist can spend all the time necessary to remove all stains that will form from time to time, and, as Dr. Hamilton has pointed out, she can show the patients how to use the toothbrush. She is not simply educating the children how to care for their teeth, but this education will be passed on to the parents. I am quite sure there is a place for the hygienist.

I am anxious to hear what Dr. Dewey has to say on this subject as, I understand, he believes there is some danger in the use of a hygienist. So far, I have not been able to see any grave dangers.

I wish to thank Dr. Hamilton for this very fine paper.

Dr. Harry L. Hosmer, Detroit, Michigan.—I have only read Dr. Hamilton's paper once, but I want to compliment him on the very efficient way he brought out the points in favor of a dental or oral hygienist. We are not responsible for the condition of the mouths of children before they are brought to our attention or come under our treatment. We are, however, absolutely responsible after we begin treatment. I think the oral hygienist, trained as such, adds a great deal to an office, and I am looking forward to the time when they will be licensed in the State of Michigan.

So far as the dangers are concerned, the only one I can think of is that we might be tempted to give them too much to do. In these spring days, when we are busy with our golf clubs, when we turn over a good deal of work to our assistants, if they are capable oral hygienists, the temptation is for them to do more work than they should do. That is all I can say on the subject.

The President.—Dr. Hosmer has told us something, namely, we are responsible for the mouth of the child when once that child is in our hands.

Dr. O. H. McCarty, Tulsa, Okla.—I have an assistant who has been in my office for five years. After being in practice one year I saw the need of a hygienist. She was a trained nurse before taking up this work in dental hygiene. This girl has been in my office for this number of years, and the prophylactic work is entirely taken care of by her. I never have to tell her when to take one of these children and clean his teeth. That is her place in the office. While I am away from home this week, if there is a band broken or anything happens, it will be taken care of by her. That is what Dr. Dewey is going to fight about. But if you train a girl hygienist, who has had a fundamental training in your ways of working, she can follow you up, and I believe a man can double his capacity for orthodontic work by having an efficient hygienist as an assistant.

The President.—We have our law started in Michigan, we are licensing them, but they have not had a chance to take a course since the bill went through. Our state law will catch them if we let them do anything outside of our field.

Dr. Martin Dewey, Chicago, Illinois.—If you have followed the dental literature and my writings in the last few years since the dental hygienist has been forced upon the dental profession, you would probably know I have been greatly opposed to it from beginning to end. I have been accused of not believing in oral prophylaxis, which is not true. I am opposed to oral prophylaxis being handled by any one who has less knowledge than a dentist. Oral hygiene is too important a subject, it is too responsible a subject, to be turned over to a girl who has had only nine months training in some infirmary or clinic which covers most of the studies in the dental curriculum.

Dr. Hamilton states that these girls get a thorough course. Gentlemen, if you can give a thorough course in nine months, you may as well close up the dental schools. When my friend Hamilton says that the dental hygienist is better able to do this work than the average dentist at the end of a nine months' course, it is a very unsafe statement to make.

The oral hygienist has burst upon the dental profession as a sort of propaganda. You may remember that a few years ago oral hygiene was advocated as being the saviour of the world. The statement was made that a clean tooth never decays, which statement cannot be refuted, because no one ever saw a clean tooth. Following that the Forsyth Infirmary was established; then came the Eastman Infirmary at Rochester, New York, and also the activities that were carried on at Bridgeport, Connecticut. These men advocated oral hygienists, they made big talks, saying that they were going to be necessary in our public schools; that there would not be enough dentists to take care of the public or to clean the teeth. So the solution advocated was to give girls nine months training in order to prepare them as oral hygienists, whereas it takes the dentist four years to complete his course. What are they doing? They are creating a demand for dental service to a certain extent and limiting the number of dentists. They are educating these people to have their mouths cleaned and to have dental service. The danger of the dental hygienist is now cropping up. In spite of the work being limited to the cleaning and polishing of teeth, Dr. Hamilton in his paper states that she takes off appliances. The minute she takes off a regulating appliance she is stepping out of her sphere and becomes a violator of the law.

The next thing you will have a lot of advertising dental hygienists, and furthermore, you will have a lot of them telling the dental profession what to do.

What is the condition in Chicago? During the influenza epidemic nurses were trained by the Department of Health, so that the directors of hospitals had difficulty. These girls, who were trained supposedly for the purpose of saving humanity and working in public schools and in clinics and in hospitals for the benefit of the public, are going out nursing private cases. They are doing things they should not be entrusted to do or by any one with that amount of education, because it is a well known fact, even if a dental student takes a four years' course, a lot of them cannot clean teeth. If you cannot teach a dentist to clean teeth in four years under college instruction, you certainly cannot teach a girl to do so in nine months.

Dr. Hamilton spoke of these hygienists taking impressions and making models. I still contend that if they can do all of that, the dental schools may as well close up. You all know the difficulty of taking impressions and of making models. Will you admit that a girl of nine months' training can do better than you can? If so, you may as well quit. I don't believe she can.

Another thing: we have had the dental hygienist forced upon us. It is illogical. It is not right. We educate the public for dental service, but educating the oral hygienist is not going to improve dental service.

The greatest prophylaxis measure the dental hygienist cannot legally perform, and that is the insertion of a prophylactic filling. In a conversation with Dr. Hyatt, of New York City, who is one of the enthusiastic advocates of the oral hygienist, he made the statement that as a result of investigation in one of the New York schools, 63 per cent of cavities were found in the occlusal surfaces of teeth, and simply polishing the occlusal surfaces would not prevent decay. That was decay from anatomical fissures, etc. The oral hygienist could not get down to and remove the decay from the occlusal surfaces of teeth. The only remedy is a prophylactic device which the oral hygienist cannot insert, and here is a great function that she cannot perform.

My friend Dr. McCarty says that his oral hygienist takes off appliances and does a lot of other things. Pretty soon she will be doing a lot of things outside of his supervision, which is another foolish thing under the law, because in most states we have a law which says that she must work under the supervision of the dentist. She takes a course, is granted a license, and then she is told she cannot do this or that, unless it is done under the supervision of a dentist. In other words, they make this girl something, and then take it away from her. They give her a license to do something, and then say she cannot do it. That keeps her from going out and working for herself, but as the number of hygienists increase they will go before the state legislature and make you look ridiculous, because any man with legal knowledge knows that if she has a license she has got a right to do something without being under the supervision of the dentist. These hygienists will change the law so that they can establish offices for themselves like we have

manicuring parlors, and the people will patronize them and say that oral hygiene is a good thing. As a solution of the problem you will see oral prophylaxis in the hands of hygienists who are not doing the people any good. It is really a fortunate thing that most hygienists from these schools will humbug a certain class of people who can afford to be humbugged. They are rendering inferior service. They will have all the hospitals and clinics working on people who cannot protect themselves.

I am not willing to admit that oral prophylaxis or the cleaning of the teeth by the oral hygienist will do the profession any good. They do not know enough about pathology or the underlying structures to give competent advice. If they did, we might as well close every dental school and educate nothing but hygienists.

Why do we have these people? Why did they come? In the first place, the name is unfortunate, "dental hygienist," because the term hygienist in the medical profession covers ground for a greater knowledge than these people possess. A hygienist in the medical profession is a man with an M.D. degree, who has taken extra training in sanitation. These girls have had no such training. Some fellows gave it a name because it sounded well. They are not even dental nurses.

In Massachusetts, when the bill came up creating dental nurse and hygienist, representatives of the nurses association appeared before the legislature and fought the bill, saying these girls were not nurses. The same thing happened in California less than a year ago. Some men decided in California they wanted a law licensing the dental nurse. The medical nurse did not want the term dental nurse. They fought that bill and changed the name. The bill was killed anyway. It will probably be revived. The dental hygienist is not a nurse or a dentist. What is she? She is the result of conditions that arose in these dental clinics. Where did they start it? At the Forsyth and Eastman Institutes, and in the University of California, because by doing that these superintendents of infirmaries got a number of girls to study something. They said, "You become a dental hygienist; it is a wonderful field. We will license you." The girls fell for that. The license says, you cannot do it except under the supervision of a dentist.

Now, I believe in oral hygiene and prophylaxis, but it is too important for a half-instructed individual to undertake, whether male or female, and you cannot give proper training in nine months. It is a nice ornament to have a good looking assistant in the office. If you are going to have that, have a dental assistant. A medical nurse has three years' training, which is thorough. She will not stand for a girl who has nine months' training, because it is unfair to the profession itself. You require men to study dentistry for four years, and yet here you expect an individual, after taking a nine months' course, to know more than the dentist does.

Let me cite one instance. In one city where they have a dental hygienist they pay her \$80 a month, while the dentist in the public school draws \$100 a month. He goes to a dental college for three or four years, and the girl, who takes a nine months' course, gets nearly the same salary as the dentist does. It is unfair, unsound, and one of the most illogical things ever brought out; still the profession is getting behind the movement and helping it along. I am very sorry to see the profession doing that. I am very glad to have the opportunity of speaking against this, and I shall have an editorial in the next issue of the *International Journal of Orthodontia and Oral Surgery* about it. A mistake does not make things right. What is the thing to do? One man said in an editorial in the *Dental Cosmos* last month, if you are not going to have a dental hygienist, what are you going to do? The dental hygienist will not supply the demand of the public. We have not enough dentists today. The thing to do is to make the dental profession attractive enough and make the public service count, so that more men will enter the dental profession and supply the needs. Instead of that, they are paying girls \$80 a month, and the dentist who has studied three or four years \$100. You are doing one thing and something else at the end, either raising dental education and the preliminary requirements of the dentist, or letting a species that do not belong anywhere practice oral hygiene. She is not a nurse, because a nurse will not associate with her. She is not a dentist, because she cannot practice without the supervision of a dentist. She is not a hygienist, because she has not taken as much training as a dentist, and she is simply a condition, a something

that has been forced on the profession by a few fellows who have mercenary ideas, something by which they want to increase their incomes, something that will bring them a greater number of patients so that they can play more golf. (Laughter.) If you cannot take care of patients and give them the treatment to which they are entitled, you are certainly doing a shoddy thing to turn them over to a hygienist who knows little or nothing about dentistry, who has had a little training in polishing the surfaces of teeth, who is no more efficient than a manicurist who polishes finger nails and could polish teeth.

That is the situation as I see it today. What are you going to do about it? Are you going to ride on the popular side and yield everything to the dental hygienist, or are you going to meet the situation fairly and squarely? If you can convince me that you can take a girl and in nine months' training teach her to do something that it takes a dentist four years of training to do, you may as well close all the dental colleges, and have nothing but hygienists. I thank you. (Applause.)

The President.—I think Dr. Dewey is wrong. He spoke about the short time it takes to educate these girls. I do not care particularly what you call her, hygienist, dental nurse, or dental manicurist. That is a good enough name for them as long as they do their work. A general nurse is given the responsibility of the whole human body, yet she only takes a three years' course. Now, why can't a girl learn in nine months how to manicure and clean teeth. A girl can manicure finger nails and cause infection the same as a girl might do in cleaning teeth. Any dentist is doing that which is criminal by playing golf, knowing that he disobeys the law by allowing a girl to take off appliances or to put in fillings. Because I want to play golf or something else, it does not detract from the value of the services of some one who can clean the teeth. The only drawback I can see against the dental manicurist is that the advertiser will get her, and he will use her for commercial gain. I do not like to hear Dr. Dewey say that it is for commercial gain, because in our state we are working for it, and I am going to tell you that no nobler bunch of men in any state can be found that want it any more than our men, and it is not for commercial gain but for the public good.

Now, it is not that the dentist will not clean the teeth, or cannot clean the teeth, he will not take the time. It is not because he does not know how, but it is because he can put in an inlay or a removable bridge while he is cleaning the teeth with a greater financial gain.

Dr. F. C. Rodgers, St. Louis, Missouri.—If this society places itself on record that the orthodontist is responsible for the condition of the mouth and health of the child, I think we are assuming a tremendous responsibility in the eyes of the public and in the eyes of the law. I do not think we realize the responsibility we are assuming. We may come to the point where a case may be brought into court and the position of this society tested in regard to the responsibility of the orthodontist to the health of the child and the condition of his mouth. We are liable to some extent in the eyes of the law. But I do not think we should assume such tremendous responsibility.

With regard to the dental hygienist, Dr. Dewey stated she is allowed to remove appliances and to take impressions. These dental hygienists can also take advantage of the privilege for edentulous mouths of sending impressions to the laboratory and having dentures made; also to place appliances in the mouth on their own responsibility, and the law will sustain such an operation if you license them as a practitioner. There are certain limitations and certain advantages which should be considered.

Dr. Max E. Ernst, St. Paul, Minn.—Our President has said that the law in Michigan is such that they can get after advertisers. Let us be thankful that they have a good law in Michigan by which they can get after advertisers and let them enforce it.

I want to say that the University of Minnesota has put in a course for dental hygienists. That course is two years. It will compare with any three-year-course for medical nurses given in a hospital. We have a provision in our law that before June 1st of last year, assistants, who had been with dentists for three years, were permitted to take an examination. How severe the examination was I do not know. The question is not whether these girls can do this work better than the average dentist can. In most cases they will do it better than the dentist does. There was an interesting article in the *Dental*

Cosmos for last November in which the author brought out some fine points regarding the dental hygienist. Whether it is the best thing for us to have dental hygienist or not, we cannot say at this time because the subject is one that is in its infancy.

Dr. Harvey A. Stryker, Rochester, New York.—After listening to this most interesting discussion I feel prompted to say just a few words. It has been my opportunity and pleasure to observe some of the work which the dental hygienists are doing in Rochester and my remarks will be based entirely on these observations.

I agree, in some respects, with what has been said relative to the limited course of instruction which the dental hygienist receives, but am inclined to take issue with those who question to a marked degree the ability of these young women to do good prophylactic work. *"I will wager that the average dental hygienist, upon the completion of her intensive course of instruction of nine months, is better fitted to do good prophylactic work than the average young man who has just been graduated from a dental college."*

In a busy Orthodontic practice one's time and attention is so concentrated on the many problems confronted each day that one does not take the necessary time to do thorough prophylactic work. Too often the patient is carelessly referred back to the dentist with the result that prophylaxis is either entirely overlooked or given but slight attention. This may be due partly to the fact that some or all of the appliances have been left in the mouth. It is my conviction, gentlemen, that we have no reason to expect that a thorough prophylactic treatment shall be performed until we have first removed even the simplest form of appliance temporarily from the teeth. Where patients must be referred, this is obviously inconvenient.

General practitioners are, in many instances, accusing us of being responsible for caries of the teeth during the period of treatment, but since extensive caries is observed in children who have never had appliances on their teeth, the accusations are often unjust. However, we face a grave and important question and it behooves us, for the good of our specialty, to face the issue squarely.

Many dentists prefer that the orthodontist assume full responsibility, as regards prophylaxis, during Orthodontic treatment. It is certainly more convenient to the orthodontist and the treatments would be more frequent and more thoroughly performed. It is not expected that the prophylactic treatments are included in the estimated fee for orthodontic treatment but are charged for as given. The patient's personal care of the mouth would determine, of course, the number of treatments required.

I will conclude by saying that I believe that our time and attention is concentrated on too many other problems, which are more important, to be annoyed with the prophylactic work. The lesser of two evils would be to have a dental hygienist in the office caring for the youngsters as often as seems necessary and instructing them in the proper care of their teeth and other detailed instruction. In this way we are going to come nearer the solution of this most vital question.

Dr. W. W. Martin, Iowa City, Iowa.—I am giving all my time from 8 o'clock in the morning until sometimes 6 in the afternoon to the State University of Iowa. We want to do down there the best we know how. I am going to say this: If you fellows will get behind your own state universities, your own colleges, and push this thing as hard as you can to help the dentists and dental students to get this training, the same as you are pushing the dental hygienist, you will have no need whatever for the dental hygienist in your office.

If I should go into private practice again, I would probably not have a girl so far as an assistant is concerned, but I would have one to look after the business part of my practice. Whenever we give up the work of prophylaxis and entrust it to others, the trouble in connection with our work begins. I am very much interested in seeing you men get behind this proposition and push it in so far as the schools are concerned. We do not have enough teachers and enough instructors, and if you will work as hard to get your state legislature to insist on these things in institutions, then your dental hygienist will have no field in the dental office.

I have been in several offices around the State of Iowa, and young men are doing good work along prophylactic lines because they are interested in it. I can speak of one

man especially who for every case he has uses a glass test tube long enough to take in a toothbrush, and that brush is sterilized and is used by himself in cleaning the teeth of the same patient each time he returns. If we are going to do the work, of course, that is a different proposition. You will have to have some one to do some part of the work. If you want to render the best kind of service you would do it all yourself and have your assistant take the business end of the proposition. I find most of our men, operative and prosthetic, are doing their own work. That is the main thing. I am thoroughly in favor of oral hygiene. I have made up my mind that I will watch my cases as they go through and see if they come in properly treated, and I began my treatment to see how much decay was caused by the orthodontic appliance, and I can safely say from now we do not cause more than 2 per cent decay in these mouths from the time we start until we get through with them.

Dr. Hamilton (closing the discussion).—I am very much gratified at the amount of discussion that my paper has elicited. I did not wish to treat this matter of the hygienist from the standpoint of the general practitioner. That was hardly within the province of the paper. I have had a hygienist in my office for nearly three years, and I feel very well satisfied and would not care to give her up.

I will not attempt to answer all of the points that have been brought out because many of them have already been answered by the different speakers who have taken part in the discussion. I made the statement that the hygienist received a thorough course. That depends perhaps on what we mean by a thorough course. From Dr. Dewey's standpoint perhaps it is not a thorough course, but as one of the speakers pointed out, the hygienist is trained for one particular thing, to clean teeth, and nine months of intensive work of that one thing certainly ought to be considered fairly thorough. I did not want to create the impression that the hygienist could clean teeth better than the dentist. I said she will do this work more thoroughly and efficiently than the average dentist, and I think most of the men here will admit that. I did not say anything about her taking impressions; I said she could put together and prepare the impressions and run models, separate and carve them.

Dr. Dewey spoke of prophylactic fillings, saying that the hygienist could not put them in. I do not know what your experience has been, but I find the average filling is not a perfect prophylactic one. Frequently I find it necessary to reshape with a bur occlusal fillings in the molars to permit proper cusp relation. I think some of the objections that have been raised have been carried to an unwarranted extent. I do not think I have gone beyond the scope which the law lays down, simply the cleaning of the teeth.

There is one thing that has been brought out here, and that is that prophylaxis during orthodontic treatment is necessary. I do not think any one who has practiced very long will fail to admit that. If it is necessary, and we can turn it over to a hygienist, we conserve our time, and keep these youngsters from waiting, we have both gained.

A PLAN OF TREATING NEUTROCLUSION WITH LABIO-VERSION OF MAXILLARY INCISORS*

BY OSCAR E. BUSBY, D.D.S., DALLAS, TEXAS

Professor of Orthodontia and Comparative Dental Anatomy, Baylor University Dental School

IN presenting this treatment for Class I, Type 2, cases of malocclusion, I do so because of the difficulties I have experienced in my own practice with these cases, and through the observance of a few of this type, which have been referred to me for continued treatment, by other orthodontists, by reason of the patient's change of residence.

The accompanying illustrations will show the result of treatment through the use of intermaxillary anchorage, and also the result of treatment by the employment of intramaxillary anchorage.

CASE 1 (Figs. 1 and 2).—The case, which is here shown, was treated with the clamp bands upon both the upper and lower first molars and labial alignment



Fig. 1.



Fig. 2.

wires. You will note the open-bite condition in the region of the incisors in the finished case. This case was taken from one of our best text books on orthodontic treatment, and the open-bite condition may be the result of one, or a combination of three things: The interlastic pull between the upper and lower arches has caused a superocclusion of the anchored teeth, or a shortening of the anterior teeth, or is possibly due to a photographic error.

*Read before the Alumni Society of the Dewey School of Orthodontia, Chicago, April 1-2-3, 1920.

CASE 2 (Figs. 3 and 4).—This case is one, which had been treated for more than a year, through the employment of the same form of anchorage as was used



Fig. 3.



Fig. 4.



Fig. 5.

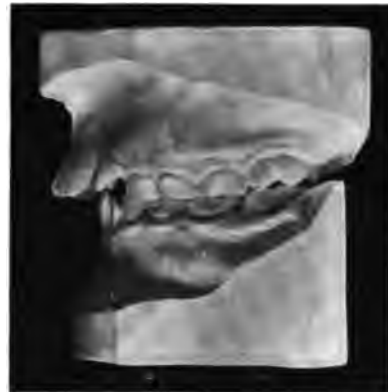


Fig. 6.



Fig. 7.



Fig. 8.

in the first case. You will note in this case also the open-bite condition in the region of the incisors.

CASE 3 (Figs. 5 and 6).—In this case, the Lourie appliance, which Dr. Dewey has so thoroughly and carefully described both in the journals and in his

instructions to students, was used, and was treated in the following manner: Through the use of a form of intramaxillary anchorage, which the appliances upon the teeth will illustrate, plain bands, with a soldered lingual alignment arch, were placed upon the lower teeth to give lateral development if necessary.

Plain bands (Fig. 7) with a soldered lingual arch, were placed upon the upper deciduous second molars and canines to give stability to the anchorage, and through buccal tubes on the molar bands, the labial arch, as is shown, was ligated to a small hook near the canine, and back of the tube on the molar bands. The traction produced by the grass ligature reduced the labial version of the upper



Fig. 9.

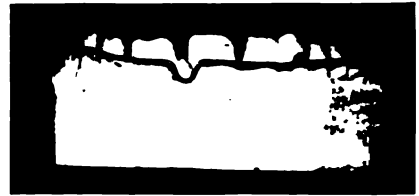


Fig. 10.



Fig. 11.



Fig. 12.

incisors (Fig. 8). Note that the open-bite condition does not here exist to an appreciable degree.

CASE 4.—In this case of an older patient practically the same form of intramaxillary anchorage was used as the last case illustrated. Instead no bands were placed upon the upper canines. Plain bands were made for the first upper molars, with a soldered lingual arch, with short extensions resting just beneath the gingival marginal ridges of the incisors, and upon the labial surfaces of the teeth was also soldered a labial (Fig. 9) arch with a loop (Fig. 10) about the median line. By slowly closing the loop, the upper incisors were caused to assume their normal positions.

In conclusion (Figs. 11 and 12) I would like to state that in the treatment of these cases, we usually find the lower arch about normally developed. Therefore, in a few instances, I have placed no appliance at all on the lower arch.

DISCUSSION

The President.—Dr. Busby has described a condition that to me is the hardest case of malocclusion to correct. He has brought it out in a very fine way, and I think his paper is worthy of a lot of discussion. The two men that are on the program to open the discussion are absent at this time.

Dr. C. M. McCauley, Dallas, Texas.—As the president has said, this is a difficult class of cases to handle, and I have handled them in a different way from what the essayist has, but I believe his method is better than the method I have been using.

The plan I have followed in the treatment of such cases consists of first molar anchorage with lingual bar as stabilizer. Buccal tubes to carry 20 to 22 gauge labial arch, which is so adjusted as to lie on the occlusal side of spurs soldered to bicuspid bands and on the gingival side of spurs on anterior teeth it is desired to lengthen. This labial bar is so bent and shaped as to exert force in the manner of a lever of the first class, where the molars represent power; bicuspid spurs, the fulcrum; and the anterior teeth, the weight.

By the essayist's plan many bands are dispensed with and that speaks volumes in the favor of his appliance, on account of their irritating effect on soft tissues. All orthodontists are trying to eliminate them wherever possible.

When Dr. Lourie first advocated the use of the high arch with soldered finger attachment I used it successfully in many cases with the exception of displacing anchor teeth badly. The lingual stabilizing bar which I now employ will remove that difficulty to a great extent.

The essayist's plan of treating these cases will be of service to me because I have now a case under treatment in which I expect to use it.

I am very much obliged to the doctor for presenting this appliance. It was my pleasure to see the same presented by him to our own state society about a month ago, and I want to congratulate this society upon having had it presented here.

Dr. W. E. Fletcher, Oklahoma City, Okla., was called upon to continue the discussion. He said: Dr. Busby has given us an excellent paper and I appreciate it very much and thank him for preparing it and presenting it before this alumni. He has covered the subject very thoroughly. I do not believe I can add anything to what he has given. I use practically this same plan of treatment in this class of cases.

The President.—The open-bite cases are important and I want to get all the information I can on this subject.

Dr. E. E. Richardson, San Francisco, Cal.—In treating open-bite cases I use plain labial expansion wires, banding the first permanent molars, soldering partial lingual wires to the bands, extending to the first bicuspids, and buccal tubes, for the expansion arch, wiring through the interproximal space engaging the lingual wire and the expansion arch (having removed the nuts). By expanding the arch relieves the close contact of the teeth and the pressure of the arch against the anterior teeth under the stress of mastication corrects the open-bite.

Dr. H. C. Hopkins, Washington, D. C.—I do not know that I can add anything of importance to the discussion of the use of these appliances in the treatment of this particular form of cases, but I am very glad to have had the opportunity of hearing these appliances brought to the attention of the society again, because I think the appliance is one of extreme usefulness, and one with which I personally have had a wonderful amount of success.

The caution given as to the danger of misplacing the molar teeth and the necessity for reenforcing anchorage with a soldered lingual arch I think is very essential, because

there is no question but that the action of the high labial arch wire is such as to readily disturb the molar anchorage if that is not efficiently reenforced.

Dr. Busby has shown you a very simple and useful method of correcting this particular character of case, and I have found the same appliance, the high labial arch wire, with the extended finger springs, very useful in the variety of cases which will successfully rotate the anterior teeth except the cuspids, and reduce the angle of inclination better than anything I have ever used; I think it ought to come into more general use, and I am very glad to see it mentioned again before the society because I think with the caution of being exceedingly careful to reenforce the molar anchorage, we will find it will be an exceedingly useful appliance.

Dr. Busby (closing the discussion.)—There is very little I can add to what I have already said, as I have told you all I know about it, and I thank you very much for this opportunity to close the discussion.

THE MEANING OF THE NORMAL

BY A. L. ROY JOHNSON, D.M.D., BOSTON, MASS.

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IN medical and dental literature of the present day there is evident a confusion of ideas as to the meaning of the word normal. In fact the variety of ways in which the word has been employed has resulted in so obscuring its real sense that the idea now conveyed by it, especially in the biologic sciences, is not at all clear. One writer uses it as meaning an ideal, a goal to be sought after but never to be found; another interprets it as being synonymous with typical or average; while yet another refers to normal as signifying the natural. Such free and indefinite use of a word is of course wholly unscientific and cannot fail to take away much of its significance. Moreover, the custom of giving the word normal such an indefinite, free, unscientific interpretation reflects a very superficial attitude toward medical and dental problems in general. You will remember that words symbolize ideas. A clear mind will express itself clearly. The form may not be pleasing but the idea will be distinct.

The nature of the structures with which the dentist is concerned, *i. e.*, the teeth and their supporting and surrounding tissues, forces him to a careful analysis of the meaning of the normal. It is even more necessary that he should have a clear conception of the significance of the word than it is in some of the other branches of medicine. This suggests a distinction, a knowledge of which is fundamental in dental science.

Although we know that literally an organism is constituted of parts mutually dependent and essential, it is a matter of common knowledge that in the human organism some parts are more essential to the life of the organism than are others. The small intestine is more essential than the appendix; the muscles of the back are more necessary to survival than are the muscles of the fingers or feet; a man can live longer without teeth than he can without a stomach.

However, to say that one organ or part is more essential to the life of an organism than is another organ or part does not necessarily mean that they are more important in a consideration of the health and development of the organism as a whole. In fact I think it is quite the reverse. The covering of hair,

the vermiform appendage, the caecum, the large intestines, and the teeth, while not so necessary to existence as the heart and small intestine, are more potent sources of disease and disorganizing deformities. Consider the frequency of cancer of the stomach; is it not safe to assume that it is associated with the limited usefulness of this organ? Men can live without teeth, yet it cannot be said that they are useless and harmful. However, the prevalence of dental disease and deformities of the dental arch argues well that the masticatory apparatus is at the present age out of harmony, to a certain extent at least, with the fundamental needs of the race. And it is because of this that the question of its care is a complex one. We should think of the teeth and the dental arch in the evolutionary sense, realizing that we are concerned with a part of the human organism unstable because relatively unessential, important in the consideration of the health and development of the whole individual because of the instability of its organization. In other words, from the fact that the forces of evolution have tended to limit its usefulness in sustaining life, a knowledge of the nature of the masticatory apparatus which is best adapted to its present function in the economy of the whole is more difficult to obtain and is as indispensable as it is difficult.

Thus in the consideration of organs and parts which constitute the more vital units in the organization of the individual the concept of the normal plays a different rôle than in the consideration of those parts which are more remote in their influence and indirect in their effect upon life processes. While a clear conception of the meaning and significance of the normal is necessary in either case, in the consideration of the latter group, the less essential parts, it is a practical necessity. The condition of one of the more essential parts of an organism directly shows itself in the functional activities of every-day life, but the relation of the appendages, accessories, disharmonies, if you will, is often so obscure in the life phenomena of the whole that the condition of their development is not so obvious. Hence the study of such structures is more complex and necessitates a more careful, comprehensive, and analytical consideration of conditions which determine its influence upon the organism as a whole; in a word, its normality.

In most of the textbooks on orthodontia, it has been customary to define "normal occlusion" as "the normal relation of the occlusal inclined planes of the teeth when the jaws are closed." I cannot believe that this definition is satisfactory to anyone. To say of normal occlusion that "it is the normal relation of the occlusal inclined planes of the teeth" does not help us in the least to know what normal occlusion is. We know occlusion to be the transient approximation of tooth surfaces; but what of normal occlusion? One might as well say in describing a brick fireplace that it is a fireplace made of bricks as to say that "normal occlusion is the normal relation of the occlusal inclined planes of the teeth when the jaws are closed" and not at the same time tell what normal is. Knowing what occlusion is, we want to know what particular form of occlusion is designated by the word normal. We know what the dental arch is, but what is a normal dental arch?

The word normal is defined clearly enough in the dictionaries. Webster says that normal is "according to or not deviating from an established norm;"

and then defines norm as "a rule or authoritative standard." As used in the organic sciences, normal is "according to, constituting or not deviating from a standard or rule which is observed or claimed to prevail in nature." Normal is not synonymous with natural, the two words do not convey the same idea, they cannot be used interchangeably.

When we enter the realm of biology it seems upon superficial reading that the word normal is used in contradictory ways. Nevertheless, I believe that in many instances the confusion is due to the difference in the nature of the conditions referred to rather than to a different interpretation of the word. The standard to which normal refers depends upon whether the problem is one of species or whether it is a question relative to the individual organism. Please note how Thomas Dwight uses the word normal in a chapter on Variations and Anomalies, as illustrating the former. He says, "There is *normally* in the human shoulder blade a little projection from the lower part of the front border." In another place he says, "There are also anomalies of tissue, in which a certain structure that is usually of one material is made of another, as when what is *normally* a cord is made of a bone or cartilage." I quote again, "Now I found this form of muscle in both arms of the chimpanzee, and Macalister observed it *once* in the tiger, though it is *normal* to neither." Here as generally in the field of morphology, normal refers to the most usual, *i. e.*, a condition characteristic of a race, group, or species. There are exceptions, but the rule is that the condition prevails. Normal refers to the fact that the conditions, though admitting exceptions, can be taken as a standard. Take, for example, the number of ribs of the individual human organism. The large majority of men possess 12 pairs. This, then, is the *normal* number for man. Yet individuals are known to have eleven or thirteen pairs of ribs. One with thirteen pairs has an *abnormal* number as regards the standard for the species, although individually he may be a perfectly *normal* organism. Hence in morphology normal signifies a standard determined by the constancy, the prevalence, the frequency of the occurrence of a condition in different organisms of a species. For this reason and for the sake of clearness it may be permissible to designate as the species normal this interpretation of the word, since we mean that the individual conforms to the standard for the species.

But when the object of consideration is the relation of an organ or part to the individual organism the standard to which normal refers is of a different kind. For instance, we know that the presence of a stomach is normal for the human being, meaning that the large majority of human beings are in possession of an organ called the stomach which presents many morphologic characteristics common to the same organ in the other human beings. But what do we mean by a normal stomach in the sense of its relation to other parts of the organism? A normal individual has two feet which possess characteristics common to the human foot, but what is a normal foot? A normal characteristic of the human being is weight, but what do we mean by the normal weight of a particular individual? So as in the species sense the word normal refers to a standard of numerical frequency, in the individual sense it refers to a standard of a functional nature, a physiologic correlation.

A normal stomach, then, in one sense of the word, is one which in function is best adapted to the needs of the individual organism of which it is a part. This is determined by its functional efficiency. The standard is a physiologic one. Although a consideration of the size, form and position of the stomach is sometimes necessary in ascertaining the cause of functional difficulties, one does not attempt to measure it or to visualize its form to know whether or not it is normal. The question of the normal is in this instance a physiologic one, a standard of functional efficiency in its relation to the life activities of the whole individual organism. In the same sense a foot is normal or abnormal as its functional activities help to maintain or to interfere with the organization of the whole individual. A normal foot is one that functions properly; an abnormal foot is one that does not. (Of course here the word function is used in its broadest sense.) Because a foot does not conform in size and shape to a conception one may have of an ideal human foot does not fix it as abnormal for the individual. The concept of the typical form of the foot is utilized as a basis for the consideration of morphologic characters, but the condition which determines whether a foot is normal or not is the relation it bears in function to the other parts of the organism. The question is primarily one of physiologic correlation. If you would know whether the weight of a child is normal or abnormal, not as compared with other children, but for a particular child, it is a problem of all vital processes and functional activities, local and general. Merely weighing the child is of little value and means nothing unless the weight is correlated with height, vital capacity, physiologic age, general form of structure, and metabolic processes. The significance of weight is derived from a study of the vital processes of the whole individual. Thus the normal is in this instance as in those above, one of a physiologic correlation. In the *individual* sense the standard referred to by the normal is in the ultimate determined by the life activities of the individual organism as a whole. A part is normal or abnormal to the individual as it affects the organization of that individual.

The same is true of the dental arch and occlusion. When either is considered from the standpoint of morphology alone it is normal or abnormal as it presents the characteristics common to the race, group, or species to which it belongs. From this position the dental arch of man is normal in its development in that it conforms to a standard of development determined by the observation and comparison of many specimens. Thus in one sense of the word the occlusal relations of the teeth of an individual are normal or abnormal as they are like the condition of occlusion that is characteristic of the majority. Normal is not perfection; it is a standard in actual existence.

In the consideration of the dental arch and occlusion of the teeth in their relation to the individual organism the normal, although referring to phenomena of a different nature, designates a standard as truly as it does in the group or species sense. The standard referred to here not only involves a morphologic correlation, but in the ultimate implies a standard of a functional nature. It refers to a condition which is most effective in establishing and maintaining in its most stable form the organization of the living organism.

The observation of the occlusal relations of the teeth of an individual as exemplified in the plaster models, enables one to ascertain in what degree the condition of occlusion approximates the typical. The occlusal relations of the teeth of an individual will never be the same as the typical in all particulars since type is not a fixed point, but an abstraction determined by the extent and direction of individual variations. One may refer to the occlusion of an individual as being normal in the sense that the condition of occlusion comes within the range of variation characteristic of the majority of the members of the group to which the individual belongs. It is normal in the sense that it possesses many of the characteristics expressed as typical.

But in orthodontia we are more directly concerned with occlusion in its relation to the individual organism of which it is a part than with its relation to the occlusal conditions of other individuals. Our problem is to determine in what degree the occlusal relations of the teeth and the form of the dental arch of an individual can vary from that which is characteristic of the group or species and yet be consistent with the needs of the individual organism. Hence in the ultimate the standard to which normal refers to the consideration of occlusion in its relation to the whole individual is a criterion of a functional nature rather than a fixed concept of structural forms and relations. Such an interpretation of the normal involves a study of life processes in general. The collective or species normal is our basis of study; our guide; our ideal in the consideration of the individual. Yet in view of the facts of variation and heredity the question of the individual normal involves a problem of physiologic correlation which designates the individual normal as a standard of a functional nature, determined by the action, reaction, and interaction of the parts and processes in the life activities of the whole individual.

The place of the teeth in the organization of the human being living today makes it imperative that the dentist, and especially the orthodontist, should study the meaning of normal. The conception of the normal dental arch is the foundation of modern dentistry. To assist in establishing and maintaining the normal functional activity of the masticatory apparatus of the living human being is its purpose. Thus the concept of the normal, what it means, what it signifies, is at the very foundation of dentistry, and its careful analysis is a practical necessity to the progress of the science.

DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

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CONGENITAL CLEFT PALATE AND HARELIP*

BY WM. L. SHEARER, M.D., D.D.S., OMAHA, NEBR.

CONGENITAL cleft palate with harelip is without question one of the most, if not the most, conspicuous of deformities which may befall a child. No more distressing a calamity, it seems, can come to parents. Especially is this true from the mother's viewpoint.

While there has been much written upon the subject of cleft palate and harelip and its surgical correction, it is evident from what we see of the results of the great majority of cases, that much more must be written and greater thought given. Certainly, greater preparation upon the part of the surgeon must, in the light of our present achievements, be given, if the child is to receive at our hands that to which he is entitled.

This deformity, when not properly corrected, is a source of grief to both the child and his parents all through life. It is a deformity so deeply felt by the one afflicted that he will shun society. In consequence of this his advancement is materially hampered along with his opportunity to gain a livelihood.

Cleft palate is the result of failure of union of those parts which make up the palate, during development in embryo. The child at birth possesses the normal amount of tissue, with rare exceptions, to form a perfect palate if properly managed. The muscles of the palate, like other muscles of the body, if not in proper function, atrophy. For example, bind one arm to the side of the body and very shortly atrophy follows.

When a cleft of the palate is not closed sufficiently early, usually the palatopharyngeus muscles do not develop as they should. In this connection we can readily see that comparatively early surgical intervention becomes necessary.

The indications and contraindications as to the time to operate different forms of cleft of the palate will be considered in a later paragraph.

*Read before the Alumni Association of the International School of Orthodontia, Kansas City, Mo., July, 1920.

HISTOLOGY AND EMBRYOLOGY

In the formation of the palate there are six centers of ossification, two maxillary, two premaxillary, and two palatal. Associated with these bone centers are soft tissues, mucous membrane, periosteum, etc., which form a normal palate. Only when an interference of some character occurs, do we have a cleft palate result, associated frequently with a cleft of the lip.

During embryologic development all babies have cleft palates prior to the second month of gestation. Near the end of the eighth or ninth week of the embryo the palatal processes should be perfectly united.

CAUSES OF CLEFT PALATE, PREDISPOSING AND EXCITING

There has been much written in all languages relative to the etiology of cleft palate, yet most may be, and unquestionably is, conjectural. This deformity is like all other teratology, subject to further investigation. Different writers



Fig. 1.—Dr. Truman W. Brophy. A true teacher.

have attributed as causes, uterine inflammation, venereal diseases, maternal impressions, pressure, defective nutrition during the early weeks of gestation, heredity and intervening mucosa in tooth enamel formation. Of the several causes, the factor standing out most convincingly to many, is heredity.

Observations made by Dr. O. A. Strauss in the study of abnormalities of animals in the zoological gardens in Berlin, October 1913, are particularly interesting. Thirty-two jaguars born of one mother by the same sire within one year had cleft palate and all died.

The parent animals were fed cold meat, from which the blood had been allowed to escape. Later the diet was changed and they were fed meat which was still warm and which contained blood, and upon this diet not a single cleft palate occurred out of two litters in one year, (about twenty-one jaguars). (Brophy's Surgery. Pages 579-80.)

On the other hand, Mall's investigation on the collection of monsters at Johns Hopkins is at least suggestive that the primary factor is located in the embryo.

It has been my experience when possible to obtain a good history of a family, that almost always a record of cleft palate is noted. In a case which I reported



A.



B.



C.

Fig. 2.—Case 1. A. Note the divergence of the nose to the left in single clefts of this character. B. Note the nose in median line of the face after Brophy operation upon the bones has been made. The Brophy operation where the bones are involved can be considered in no better sense than the "foundation upon which the house is built." C. Completed case. Age, sixteen months.

a few years ago, where all knowledge of cleft palate history was denied, close study revealed a small niche in the mother's upper lip, left side. Then, too,

parents are reluctant to give their true history, so it is often difficult to trace heredity.

As a general thing, nature does not fail to provide sufficient tissue to form a normal child with a normal palate, but often fails to bring the parts in apposition so union will result. We are consequently dealing with a true arrest of development.

No doubt falling metabolism may play an important role in a certain few instances. However, it is my belief that the child may be generally a weakling and yet be normal as to formation of parts.

It has been stated by Professor Warnekros that supernumerary teeth are always the cause.

The late Doctor C. F. W. Boedecker attributes the cause to intervening mucosa during the formation of the teeth, as at that time the mucosa dips deep down



Fig. 3.—Case 2. *A.* Double cleft palate with premaxillary protrusion. This premaxillary bone should never be excised. It contains the temporary as well as the permanent tooth follicles. A calamity follows the excision of the premaxillary bone which it is impossible to correct. *B.* Profile after Brophy operation is employed for the setting back of the premaxillary bones into position to form a normal arch.

into the submucous tissue and forms the epithelial lamina, which later contracts into the epithelial cord at the distal end of which the enamel organ is formed thus forming an obstruction in union of the tissues.

Brophy says, "It seems that Boedecker's conclusion that this epithelial cord delays union of the parts forming the maxillæ, and the force exerted by the tongue and mandible from the beginning of the third month until birth and several months later, would account for the separation of the maxillary bones and the creation of the cleft."

Uterine inflammation and venereal disease: no doubt venereal diseases are the cause of many physical defects, also uterine inflammation may effect the development of the palate, as it does many other parts of the body.

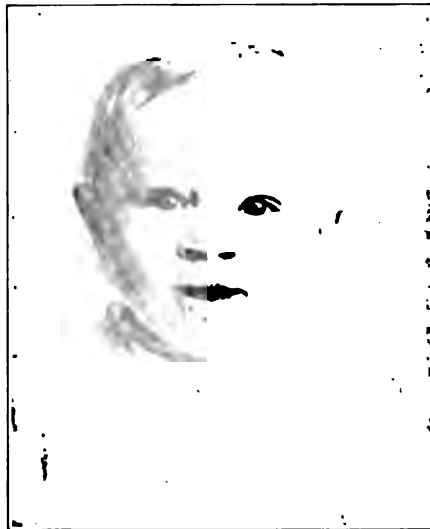
Dr. Charles Mayo believes and has said, "There is a great principle involved in the causation of birth deformities, and it is one which should explain various types of deformities. As he observes birth defects or anomalies, it is apparent that many of them are normal conditions in some lower type of life, e.g., harelip,



C.



D.



E.

Fig. 3.—Case 2. C. Front view after bone operation only. D. Immediately after correction of lip deformity. E. One year later.

cleft palate, fissure defects, etc. Anomalies in circulation, multiple ureters, location of organs and defects due to changes in the evolution of the invertebrate to the vertebrate which largely affect the nervous system, acephalus, hydrocephalus, spina bifida, club foot, and postanal dermoids.

"Experimentally, changes in the salts in which the eggs of several of the lower forms of life are developed, lead to a certain percentage of anomalies. This is undoubtedly the reason why a high type of fish, like the salmon, probably in an evolutionary state, leaves salt water to lay eggs in fresh water.

"Anomalies in the human embryo occur in variation of fluid, especially excessive quantity of hydramnion. It is most probable that the cause of embryonic deformities is due to changes in the salts of the amniotic fluid in which the egg is developed, just as it has been proved to be in the lower types of life."

We are therefore inclined to conclude that whether from inflammation of the female pelvic adnexa or from a more subtle cause, the early nutrition of the embryo is interfered with, thus producing a disharmony of the growth energies.

Exciting cause: The tongue is thicker between the second and third months of intrauterine life than it is at birth, and consequently takes up more space between the developing bony plates of the palate, thus interfering with their meeting and union. The muscles of mastication becoming active about the third month brings pressure from the mandible on the flexible bones of the palate, serving as a wedge, forcing the halves apart, resulting in a much wider breach.

Normally, the upper jaw, from tuberosity to tuberosity, is smaller than the lower jaw. If careful observations are made of a child with a complete cleft of the hard and soft palate, it will be found that the upper jaw overlaps that of the lower. This makes it easy to see how the mandible may and does spread the two halves of the upper arch.

The normal position of the fetus in utero is such that a great part of the body weight may be thrown upon the vertex, and the pressure exerted tend to force the mandible into contact with the sternal region, and compress it against the forming hard palate. The head being in a flexed position with the symphysis of the mandible resting on the sternum, may add to the force exerted by the mandible.

PHYSIOLOGY

It is most difficult for a child with cleft palate to swallow, and to draw its milk, and as a result they are very poorly nourished. The milk taken, in the act of swallowing, regurgitates through the nose, a most distressing and pathetic sight. Dr. Brophy has designed a nipple that enables the child to take its food with little difficulty, and it is surprising how quickly they recognize this and poke their noses around in search for the nipple before beginning to nurse from their mother. He has also designed another nipple for the bottle babe made on the same principle. I have been convinced many times that the value of feeding the infant preparatory to surgical intervention was sadly overlooked. Failure to secure proper nourishment is a valid reason for early operation.

The anatomy of the palate will not be considered in this paper, other than to state that there are, as classified by Brophy, fifteen forms of cleft palate and that the form decidedly governs the time of operation, etc.

TREATMENT

It must be borne in mind that the palate is one of the most important organs of speech, and it being directly attached to the larynx, makes it a most valuable

factor in voice production. The articulation of consonant sounds is very difficult for cleft palate children. I recall one young lady twenty-seven years old, living in California, for whom I had operated an extensive cleft palate, who had much difficulty in learning to talk. I kept in correspondence with her for two years directing her in learning to speak over again.

Great patience should be manifested for those so afflicted, as they have more trouble than we are able to appreciate and are almost always too timid to seek



A.



B.



C.

Fig. 4.—Case 3. A. Illustrates rather extensive cleft of the hard and soft palate for a woman forty-four years of age. B. Palate completely closed with one operation. No lateral incisions were employed. C. Photograph of patient.

our cooperation. A neurologic perversion may have become established in the brain center, which is most difficult to correct. We must remember that the closure of the palate is not the only thing sought for, the most important, by far, is presenting to the patient a flexible, resilient palate, which is so much needed in speech, etc.

A babe with complete cleft palate and either single or double harelip should be treated in three steps, as follows: 1. Closure of cleft involving the anterior ridge of the hard palate if possible within the first month to six weeks of age. 2. Lip and nostril, six weeks after the bone operation, or earlier, if the bone operation has been successful and the splints removed. 3. The soft palate about the fourteenth to sixteenth month, preferably.

The general condition of a babe should be considered carefully. Too often these children are brought to the hospital and operated at once. Then in a couple of days a cold develops which may have been picked up on its way there, which, added to the anesthetic and operation, may result in pneumonia and death.

The bone surgery should be done early before ossification has advanced, the bones being more easily moved to the position desired and the shock is much less to the patient. At birth the bones are about half organic matter and easily bent.

When there is a double cleft with premaxillary protrusion, this premaxillary bone must never be excised. Deformity follows which is by far greater and

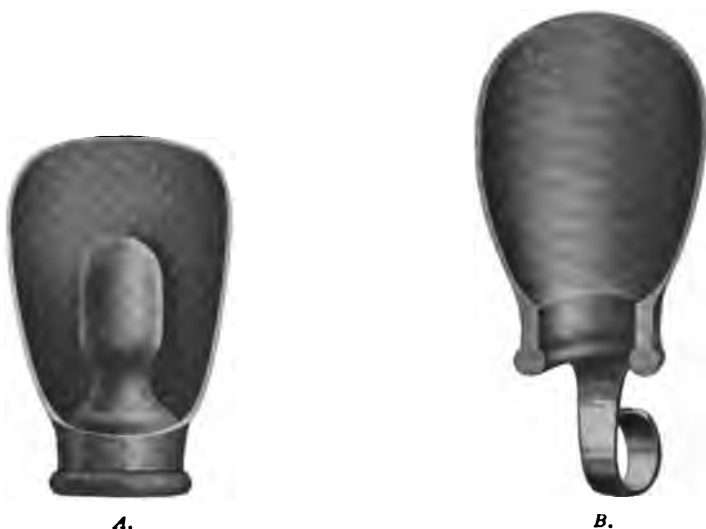


Fig. 5.—Brophy nipple. A. For bottle. B. For breast feeding.

more difficult to repair than that originally presented. It is in fact, a calamity which cannot be repaired.

With the excision of the premaxillary bones go the tooth germs, and the child is forever missing temporary as well as permanent teeth. They must be put back into position to form a normal arch.

Operations performed in early infancy afford the best results, yet very successful operations may be made at almost any time in life.

It cannot be too frequently repeated that the first undertaking should be the closure of the cleft of the bones, because herein lies the success of subsequent operations. With proper surgical principles and technic, the normal physiologic functions of the palate are restored.

It seems to be almost useless to endeavor to outline the steps of this work in detail, as it is a physical impossibility to get surgery from books or papers. It

must be gained by assisting or carefully watching the work done many, many times, the same as any and all other surgical procedures. The many complications encountered in this field try the ingenuity and patience of the surgeon to the very utmost.

Certain definite steps must be carried out to give the child a flexible, resilient palate. A specially designed periosteal elevator, known as the Brophy periosteal elevator, should be used to perfectly separate the soft tissue from its attachments. Great care is necessary in the very initial step of passing through the muscular mucosa down to the periosteum in the process of lifting the soft tissue. It should be freed all along the posterior border of the horizontal plates of the palate bones, extending down and back of the hamular process on either side. Very rarely is this accomplished in cleft palate surgery.

When the horsehair coaptation sutures are placed, no tension can be allowed or sloughing will follow and the operation result in failure. It is necessary at this time to place tension sutures of silver wire supported by lead plates to prevent tension on the horsehair sutures, as described above.

In this operation postoperative care is most essential. Isolation of bacteria being impossible, it is necessary to carefully irrigate the parts after each feeding, and in some cases half a dozen times a day. When it is impossible to isolate an organism, it must be combatted by other means, and in this instance constant irrigation is considered one of the laws of success.

In the last two operations, namely, the lip nostril and the soft palate, great care should be exercised not to traumatize the tissue more than it is necessary, as sloughing, particularly in the soft palate, is apt to follow.

Lateral incisions in the soft palate should never be made, (they are unnecessary), because in so doing, the tensor palati muscle and nerve are very likely to be severed, and once severed, do not unite. Following in the wake of this unfortunate procedure is deafness, owing to the fact that by traction in the act of swallowing and speaking the tensor palati muscle dilates the pharyngeal orifice of the eustachian tube.

Permanent sutures left in the mouth at the completion of any of these operations should be silver wire, lead plates and horsehair, for the reason that they do not absorb the saliva which is constantly contaminated with different forms of bacterial life. Older cases are not complete until speech training has been initiated.

It occurs to me in connection with this paper that it would not come amiss to say a few words relative to the preparation of young men for this work in our medical colleges. It is a rare exception to find a medical college wherein the students enjoy the privilege of having this subject properly presented to them. It is my opinion that no surgeon will question the advisability of having this subject taught by men who are specially trained in this line of surgery. Also I think no one will question the fact that we will have fewer unhappy results if this subject is given the thought to which it is entitled.

I believe that in the field of medicine and surgery a new era is dawning. With greater preparation it seems but logical to infer that altruism in the minds of a greater number of men will be practised.

I hope that no one, in or out of a medical college, student or teacher, will

take the foregoing remarks, in any manner as personal. They are only intended in the light of constructive criticism to the advancement of this class of surgery through better preparation.

In closing, it seems to me that the following quotation from Emerson is most fitting:

"I wish more to be a benefactor and servant than you wish to be served by me: and surely the greatest good fortune that could befall me is precisely to be so moved by you that I should say, take me and all mine, and use me and mine freely to your ends: for I would not say it otherwise than because a great enlargement had come to my heart and mind which made me superior to my fortunes. Nothing shall warp me from the belief that every man is a lover of truth."

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Overbite. J. H. Badcock. *The Dental Record*, 1920, xl, No. 9, p. 570.

The most successful method for the treatment of overbite in the form of postnormal occlusion, with no point of contact between the lower incisors and the upper incisors, is probably that of the biting plate in the upper jaw, which impinges on the lower incisors exclusively. This allows all the back teeth to lengthen together, so that when the plate is taken out the strain is distributed among them all, instead of being taken by one or two. It has the further advantage of depressing the lower incisors. If in conjunction with it an arch is used going round the upper incisors, the tendency which it otherwise would have, to force them further forward than they already are, is counteracted; and if to that arch little hooks are added which hook over the incisive edges of the upper teeth, one is able not only to lengthen the back teeth and shorten the lower incisors, but to shorten the upper incisors too. Experience has taught the author that it is not always necessary to open the bite before beginning to treat such cases. Some cases were treated by him by the extraction method without opening the bite.

Plastic Work in Surgery of the Jaw. George V. I. Brown. *Wisconsin Medical Journal*, 1920, xix, No. 4, p. 143.

Surgical judgment based on practical experience during the war has brought definite conclusions with regard to the selection of operative procedures that could not have been otherwise acquired in many years of ordinary practice. The principles which should govern the selection of a method for plastic, facial, or maxillary reconstruction are as follows: The form of overlying facial soft tissues is necessarily dependent upon the underlying bony framework. When the form of the jaw outline cannot be restored by bone grafts or cartilage transplants, then a suitable artificial appliance should be placed so that this form may be restored, and the soft parts moulded to fit over these surfaces, and held in suitable form thereby after operation if necessary. No tissue or other anatomical structure should ever be transposed or transplanted unless it be apparent that it is absolutely impossible to close the defect by the aid of adjoining struc-

tures. The nearer the operator can come to restoring normal functional activity by the correct alignment and attachment of the muscles of the affected part, the greater will be the certainty of good cosmetic result with continuance of improvement as time goes on. When anatomic integrity is violated by the introduction of foreign tissues or mal-muscular attachments, the effect will not be so good and unsightliness will usually become more and more apparent as time goes on. These rules according to the author's belief form the basis of all the governing influences that affect operations for harelip, cleft palate, and similar congenital defects, and they are just as true when the deformities are due to war or other injuries.

The success of subsequent corrective treatment is dependent upon the observation of certain principles immediately at the time of the injury. For example, the loss of a portion of the horizontal body of the mandible presents the alternative of forcing the fragments apart in order to bring the teeth into normal occlusion, in which case only a fibrous union must result, and a bone graft be required later on unless a permanent prosthetic appliance is worn continuously, or the drawing forward of the ramus to permit of its being attached to the end of the remaining jaw without regard for the disarrangement of the occlusion of the teeth. Both these methods have been strongly advocated, and both have been quite extensively employed. Basing judgment on the results as shown by many cases treated by both methods in the overseas hospitals that came under the author's observation after their return, it appears to be safe to conclude that each one of these methods of treatment has its advantages and both have disadvantages which should be avoided as much as possible. Approximation of the remaining portion of the body of the mandible to the ramus, and fixation by suture, provides the advantage of immediate healing and consequent relief for the patient, also in those cases in which there is considerable disarrangement of the occlusion of the opposite sides of the jaw. The disarranged tooth occlusion is apt to undergo a certain improvement as the result of a very considerable readjustment on the part of the ramus.

Etiology, Symptoms and Treatment of Alveolar Pyorrhea. Sebba. Zahnärztliche Rundschau, June 29, 1920, xxix, 26.

The author refers first to the *Spirochaeta pyorrhoica* of Kolle as the alleged cause of this affection. Study of the modern literature of pyorrhea leads to confusion as to what is really in the minds of the authors, although the original syndrome was clear and simple. The view that the affection can be caused by the spirochete in question is both premature and false. During 1919 Beyer endeavored to revolutionize our old conception of the affection. He tried to visualize a spirochetosis of different degrees beginning with gingivitis, including ulcerous stomatitis and Vincent's angina and ending in alveolar pyorrhea and noma. According to him each disease can be evolved from one of the other forms. Thus either a gingivitis or ulcerous stomatitis can become a pyorrhea. This the author disputes while conceding that a pyorrhea often begins with gingivitis. The spirochetes and fusiform bacilli of Vincent are found in so great a variety of disease that they cannot be looked upon as the pathogenic agent

in all, but rather as indicating often a secondary infection, or as having no significance at all. Beyer is very confusing concerning the mode of origin of pyorrhea from stomatitis ulcerosa. He claims that as a result of pocket formation due to destruction of the circular ligament the tooth loosens and falls out. But only in rare cases is pyorrhea preceded by ulcerous stomatitis. The latter condition was fearfully prevalent during the war yet no corresponding accumulated incidence of pyorrhea was seen. Further statements by both Beyer and Clemm concerning the symptoms of pyorrhea are not in accord with the experience of most dentists. This latter is as follows: pyorrhea begins insidiously; the alveolar border and circular ligament disappear and are replaced by granulation masses between the gum and alveolar margin. As a result of these, the affected teeth slowly loosen. The granulations constantly discharge pus while concretions form on the teeth beneath the gum line. The gums later become spongy and bleed easily. Fever, ulceration, severe pain, and sequestrum formation do not occur. Neither the cause nor the development nor symptoms as stated by Beyer have any counterpart in the clinic, nor is the process influenced by spirocheticides like salvarsan, although this may be a specific for true Vincent's diseases.

Leucoplasia Buccalis. Scervini. La Riforma Stomatologica, 1920, ii, 2.

The author concludes his study as follows: we are still uncertain of the intimate nature of this condition despite all of the clinical and histological work which is being constantly devoted to the subject. There are as hitherto two aspects of the problem which chiefly mystify us. One, of course, refers to the influence of syphilis in the genesis of these lesions, while the other deals with the effects of tobacco. At one time the profession believed fully in a special nicotinic type of these lesions in which tobacco was *per se* able to give rise to the latter. Of late years we have learned that nicotine is able to cause a patchy degeneration of the walls of the larger arteries, but it is a far cry to a belief that tobacco can give rise to these mucous lesions as a result in part of absorption. Is there any necessary connection between simple long continued irritation of the mucosæ and the appearance of these leucoplastic areas? Histology should throw some light on the nature of the lesions and it is by no means certain that it has had its last say on this subject. Is it possible to distinguish by the clinic and microscope between a syphilitic leucoplasia and a nonsyphilitic type? The author's own experience leads him to believe that the affection is the result of an infection or intoxication and that it is seen by preference in the arthritic. It is also seen in the neurasthenic. It is clinically a polymorphous manifestation, but the toxi-infectious theory is broad enough to embrace both the syphilitic and nicotonic cases even if the latter causes act only as determining or contributory factors.

Infected Apices of Teeth; Pyorrhea Alveolaris. Westlake. Medical Record, July 10, 1920, cxviii, 2.

The author opposes promiscuous extraction which threatens to displace to a greater or less extent the conservative procedures of apicoectomy, ionization, high frequency, etc. Thanks to conduction anesthesia, these resources had been

robbed of their terrors. In one session it has become possible to extirpate surgically the pulp, and fill the root, leaving the permanent crown filling for a second session when convenient. The author laid the foundation of dental electrotherapeutics in 1892 in a paper on cataphoresis and now upholds the contention that ionization destroys germ activity by coagulating the protein of the microorganisms in the infected apices and bone sinuses. Concerning radiology he does not believe that small dark points at the apices imply the power to cause constitutional disorders. The infected area must become definitely circumscribed and show coagulation-necrosis in order to indicate the possibility of systemic infection. Suppose the body resistance to be lowered from some cause, with the development of an arthritis or neuritis: if in such a case a tooth is not actually throbbing or sensitive to percussion it is hardly reasonable to accuse it as a primary cause. In one month of 1919 the author saw 117 cases of pulpitis, periostitis, and periodontitis, and only 15 failed to respond to treatment: these required 4 extractions and 11 root resections. Under pyorrhea the author mentions as remote prodromes in young men and women a red line on the gum margin—the period of latency may reach to 15 years. In 32 years of experience the author has found hardly any exception to the rule that in pyorrhea there are constipation and the presumption of autointoxication. The author's article is rich in statements based on extensive personal experience and should be read in the original.

War Injuries of the Jaws and Their Treatment. T. Jackson. The Dental Record, 1920, xl, No. 9, p. 562.

A special hospital for war injuries of the face and jaws was formed at Sidcup, in 1917, a unique one of its kind in that its staff was composed of Australian, Canadian, New Zealand, and British Officers, supplemented at one time by a large colony of Americans—a true intercolonial hospital. Each section was complete in itself, surgeons, medical officers, anesthetists, dentists and nursing service. The dental profession was prepared for the simpler type of maxillary and mandibular injury, but in war experience the injuries naturally became much more complicated, and expert radiographical service with special experience of jaw injuries was required for the rendering of a correct diagnosis as the basis for proper treatment. In no branch of the work is close cooperation between surgeon and dentist more desirable than in the treatment of the more severe types of maxillary injuries. No tissues, hard or soft, must be wasted. In the treatment of fractures of the mandible, no vital portion of bone should be removed. Great success has resulted from simple moulding of multiple fragments into position and retaining them by means of a combination of an external chin-piece and an intraoral splint. With regard to extraction of teeth in the treatment of mandibular fractures, the author points out that the great aim is to obtain osseous union and a good functional result, and no teeth should be saved whose presence militates against this aim. Displacement of the posterior fragment, meaning the portion behind the last remaining tooth, is usually associated with a deviation of the larger fragment toward the side of fracture. Extraction of upper molars, or even partial excision of the tuberosity of the maxilla, has been practised for the control of the resulting deformity.

Plastic Operations on the Mandible. E. Warkalla. Beitrage zur Klinischen Chirurgie, 1919, cvi, p. 356.

Among 41 cases of pseudarthrosis in general, 11 cases concerned the mandible, according to the author's observations; this relative frequency being due to the following factors: (1) Tendency to fracture of the mandible, on account of great friability of the brittle bone, which is poor in spongiosa. (2) Invariable infection from the buccal cavity. (3) Difficulty of absolute rest and fixation of the bone. (4) Apposition of the fractured ends is not permissible, even in small defects, in the interest of function. For the removal of pseudarthrosis, bony suture does not enter into consideration, and pedunculated plastic procedures are only rarely applicable. The method of choice is free autoplasmic bone-transplantation. In the author's cases, the graft was always taken from the clavicle, except in two instances. This procedure affords the following advantages: (1) The clavicle furnishes sufficient material also for large defects, unless very thick segments of bone are required. (2) The grafts fit ideally into the defect, on account of their natural curvature. (3) Their removal is never injurious, as was sometimes observed with the removal of large wedges from the tibia. (4) The removal is very convenient, the graft being taken from the vicinity of the field of operation, so that this site can be included in the anesthetic zone. (5) The patients may get up as soon as the first day after the operation. A preliminary requirement for the performance of a plastic operation is the completion of all necessary interventions on soft parts, such as removal of all fistulas or foreign bodies, plastic procedures on the lips, and so forth. After all wounds have completely healed, at least four weeks must be allowed to elapse before the performance of the plastic operation. The site of the pseudarthrosis is exposed by a curved incision. The graft has a thickness of only two to three mm. and a width of five to seven mm. Fixation with simple soft parts sutures was found to be sufficient. In all aseptic cases, firm consolidation took place; the largest defect was 6 cm. long. The eleven cases include only one complete failure, due to infection; in nine cases, the operation proved highly successful. The certainty of success in plastic operations on the lower jaw is dependent upon (1) the avoidance of infection, and (2) the reliability of fixation. Infection is most reliably guarded against by a simple technic requiring only a short time. Fixation is best accomplished by strapping of the upper and lower jaw.

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EDITORIALS

The Boston Session of the National Dental Association

THE Twenty-fourth Annual Session of the National Dental Association was held in Boston, August 23-27, 1920. From the report of this session as given in the *Journal of the National Dental Association*, the meetings were a great success. The editorial in the above journal states that the session was a great meeting and is now a matter of history. We agree with the latter statement, but beg to amend the interpretation of the first.

From the standpoint of numbers present, membership, etc., the meeting might truthfully be said to have been the "biggest and best." The amount of money collected for various purposes and the advancement toward a permanent fund for the support of the *Journal of the National Dental Association*, all point to the interest manifested by the profession as a whole in the National Dental Association. Activities in the House of Delegates would tend to prove that the

Association existed for a purpose, even though the purpose might be the settling of whether "whiskey and brandy should be in the United States Pharmacopeia.

From the standpoint of the ordinary member, we do not believe that the success of a meeting can be judged by the activities in the House of Delegates or the amount of money collected by the secretary. Neither can success from a scientific standpoint be judged by these things. After the average man admits everything that the secretary calls attention to, and when he considers some of the things that were more evident in the meeting than the workings of the House of Delegates, he will be forced to the conclusion that the meeting was radically different from "the biggest and best," and will say, as we have heard many say, "This meeting is the worst I have ever attended." Yes, the Boston meeting, from the standpoint of the average member, was the worst we have ever seen, and we have seen several. Some of us who attended the New Orleans meeting thought things were about as bad as they could be. We heard several say at that meeting that they would never attend another, and, while conditions at New Orleans and Boston were not exactly alike, we prefer New Orleans.

Unless the meetings are planned differently in the future, they will not be representative of the dental profession. Very few men will attend year after year if they do not get more out of the meetings than they did at Boston. The sessions will be made up of men from the territory in which they are held.

From information gained from section officers of the Association, we understand it is now difficult to get men to give papers. At New Orleans essayists complained that they could not get audiences. There seemed to be a tendency in the minds of some at New Orleans that the Association was drifting into an organization that was more of a social affair than one given over to scientific research and the consideration of subjects of interest to dentistry. While the social activities were not made so prominent in Boston, it is safe to say that the scientific and practical sides of dentistry did not receive proper consideration. This was not exactly the fault of the officers of the Association, but was because the meeting was planned without taking into consideration the fact that it was to be the "biggest and best" from the point of numbers; for it was the large attendance that ruined it, to a certain extent, as a scientific session.

A mistake was made in trying to hold all the sections in one building that was in no way suited for such a purpose. It would have been an ideal place for a political convention or Elks' Carnival, but for a meeting place for sections of a scientific organization, it was out of the question and impossible. Instead of having properly equipped and separate rooms for each section as advertised by the advance press notices, the majority of the rooms were simply hallways that had been partitioned off by canvas and screens. The temporary partitions probably made a good appearance before the committee when six or eight people were in the building, but when a large number was present, so much noise and confusion could be heard through the various rooms that it was practically impossible to hear a paper read. It was also impossible to properly darken a room for the use of the stereopticon. The arrangements were so poor that one chairman refused to call his section to order amid the confusion, while other sections had to change rooms in order to hold their meetings at all. It sounds big to send out information that all sections of the National Dental Association will be

held in one building; but the sad experience in Boston proved the fallacy of such a belief.

Another poor arrangement at the Boston meeting was the prominence given the dental dealers' and manufacturers' exhibit. In fact, it appeared that the Boston meeting was planned especially for the dental supply houses. We believe that the exhibits should be far enough away from the section meetings not to interfere with the scientific purposes of the organization. In Boston the entire lower floor of the building was given over to the commercial men while the upper floor was used for the Association meetings; and every one who attended the scientific sessions or clinics was compelled to go through the section of exhibits. We have no grievance against dental supply men, and we believe if they are charged for space at the National Dental Association meetings, they should be given some time. However, as much as the dental supply man is a necessity, we believe he does not belong at the National Dental Association meetings or any other dental meeting. The National Dental Association is large enough not to have to be dependent upon exhibitors for money. If we are mistaken in this, we still contend that something must be done to keep the Association from becoming a side attraction to the dental exhibit.

It has been previously mentioned that it is becoming difficult to get men to read papers before the National Dental Association, and this difficulty will increase unless more attention is given to the scientific sections. No one is going to try to listen to a paper amid such noise and confusion as existed at the Boston meeting. We hope that officers of the Association will profit by the mistakes of the Boston meeting, and not repeat the same thing at Milwaukee.

ORTHODONTIC NEWS AND NOTES

The editors desire to make this department a permanent feature of the Journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

Glasgow Odontological Society—Session 1919-1920

The fourth meeting of the Session was held in the Dental Hospital on January 20th. Twenty-four members were present, and the President occupied the Chair.

The minutes of the previous meeting were read and approved.

Messrs. John Young Graham and John Crawford were duly elected to the membership of the Society.

There were no Casual Communications, and the President called on Captain Thomas Jackson to read his paper on "War Injuries of the Jaw and Their Treatment." (This paper will be abstracted in an early issue of this Journal.)

Captain Jackson illustrated his address with a large collection of lantern slides, some of them especially prepared for the occasion.

Notes of Interest

Dr. L. R. Sattler announces his location at 680 Brandeis Building, Omaha, Nebraska, where he will succeed Dr. W. E. Stoft in the practice of orthodontia.

Dr. Bernard G. DeVeries announces that he is now engaged in private practice at 933-934 Metropolitan Bank Building, Minneapolis, Minnesota. Practice limited to orthodontia.

Dr. C. H. Rangeley announces the opening of his offices, Suite 603-604, Medical Science Bldg., 1029 Vermont Ave., N. W., Washington D. C., for the exclusive practice of orthodontia.

Dr. Harry W. Wilson, formerly of the partnership, Drs. Hoffman and Wilson, announces the removal of his offices to Suite 606, Metropolitan Building, Denver. Practice limited to orthodontia.

Dr. W. T. Chapman announces the opening of his office at 505 Martin Building, El Paso, Texas. Practice limited to orthodontia.

Dr. H. B. Tileston, Jr., announces the removal of his office to Suite 719-720 Starks Building, Louisville, Ky. Practice limited to orthodontia.

Dr. E. Everett Voyles announces that from October 1, 1920, his practice will be limited to orthodontia. Offices removed to 808 Odd Fellow Building, Indianapolis, Ind.

Dr. W. J. Fitzpatrick, Miami, Florida, will limit his practice to orthodontia beginning November 1, 1920.

Dr. John A. McPhail announces the removal of his office to 408 Bell Block, Cincinnati, Ohio. Orthodontia exclusively.

Mrs. Katherine Stiles announces the marriage of her daughter, Eva Thelma, to Dr. Edward L. Mitchell, on Saturday, the third of July, 1920, Newport, Kentucky.

Dr. Charles H. Patton announces that after October 15, 1920, he will be associated with Dr. Samuel P. Cameron, 2011 Chestnut St., Philadelphia, Pa., where he will limit his practice to the care of children's teeth.

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ORIGINAL ARTICLES

PRINCIPLES OF RETENTION IN ORTHODONTIA*

BY CALVIN S. CASE, M.D., D.D.S., CHICAGO, ILL.

PRELIMINARY

IT may be well for me to state that the paper which I am about to read does not pertain—except incidentally—to any form of technic, retaining appliances or plates. Its main object is to present certain principles of regulating which I have found indispensable to the permanent retention of certain inherited dento-facial malocclusions. Particularly those in Classes II and III, in which are found pronounced disto-mesial malocclusions with protrusions and retrusions of one denture or the other.

The principal claims of the paper pertain to the inadvisability of extensive reciprocating disto-mesial movements of the entire dentures to a normal occlusion with the intermaxillary force. It advises instead, the movement of the buccal teeth to a perfect interdigitating masticating occlusion, and the correction of the facial outlines with the required movements of the front teeth alone.

If there is one part of orthodontia more than another that is absolutely indispensable to the success of this specialty and its establishment upon a firm foundation as one of the arts and sciences, it is the permanent retention of regulated teeth.

We may possess high ideals in regard to the relations which the teeth and dentures should bear to each other and to the facial outlines. We may be able with our facilities and chosen methods to move the teeth in a manner and to positions which fulfill all the requirements of our understanding of perfect correction; and we may be justly proud of the really wonderful results which

*Read before the meeting of the American Society of Orthodontists, April 5-7, 1920, Chicago, Ill.

we, at times, are able to accomplish. But after all, what does this temporary pleasure and satisfaction to ourselves and our patients amount to, if we find in a few years that the very cases which create in us the greatest pride, are going back to their former malpositions and disharmonies, in spite of everything we have been able to do with retaining appliances. Or, if at the close of our operations proper we are conscious of the possibility and even probability of ultimate failure, judging from other similar cases that were corrected in the same way, and with the same proposed methods of retention. This naturally leads one to lose confidence in the high ideals of his profession.

The art of moving teeth in the correction of irregularities has been regarded in the past as so nearly the whole of orthodontia, that the retention of corrected teeth was largely considered a matter of course, and its importance, its difficulties, and its uncertainty of permanency were lost sight of, or regarded thoughtlessly as a very minor branch of the art of regulating. It is possible and even probable that the art of retention will never approach so nearly to an exact science as that of regulating, because of certain natural influences over which one can have little or no control. Yet it is nevertheless a fact that the principal failures along this line have been and are largely due, first, to a lack of appreciation of the forceful influences of heredity; second, to a wrong system of regulating which leads to placing too much dependence upon the normal locking interdigitation of masticating cusps; and third, it has been due to inadequate retaining methods and appliances, and the unfortunate tendency among a large class of orthodontists to avoid everything which demands considerable personal training in high technical skill.

To be sure, the occlusal interlocking of cusps and other harmonious relations afforded by a normal occlusion are of the very greatest importance to retention. This also is quite as important in those cases where a normal occlusion is not advisable, on the same principle that decidedly irregular teeth are often held in malpositions solely through the interlocking of the masticating cusps of abnormal occlusions.

And yet in no instance of regulated teeth can the most exact interlocking of masticating cusps be depended upon solely to combat the forces of heredity, or of even long-standing malpositions which have involved a considerable maldevelopment of the alveolar process and maxillary bones. Therefore, we are dependent upon retaining appliances or fixtures which will hold the teeth in their regulated positions and completely combat the forces of reaction toward every character of regulated movement, until nature is given a chance to restore or build a new foundation around the roots, to stabilize their new positions.

If the movements in these cases have been extensive, involving a number of teeth side by side moved in phalanx, as in the linguo-buccal movements in arch expansion, or extensive disto-mesial shifting of the buccal teeth to normal occlusion, or if a whole or a part of the movements has been in the nature of bodily movement, we are certainly up against a big proposition; and a proposition moreover, which we must successfully meet, or acknowledge that our profession of orthodontia is a failure, or at least that a large proportion of our most important and satisfactorily finished cases cannot be permanently corrected.

One of the most prominent orthodontists of New York City said to me, in

substance, a few months ago, that the practice of orthodontia was beginning to be feared by many of our best orthodontists as more or less of a failure. And when I asked him why, he said: "Because it is impossible to permanently retain a very large proportion of our regulated cases."

If this statement is true, coming as it did from one who is in close touch with the pulse of his profession, I must say that I regard it as one of the most healthful symptoms of our evolutionary progress that has arisen for many years in this department of dentistry. It shows in the first place, an appreciation of the indispensable importance of retaining the positions of our regulated cases permanently, not merely during the period of artificial retention, but in after years; and it shows also, that a very large proportion of orthodontists have deeply considered the seriousness of failures in this regard, and are not wholly satisfied with the retention of their previously regulated cases. Consequently, their minds may be open for a thorough study and possible application of some of the principles to which I am indebted for the correction and permanent retention of a large proportion of the most pronounced dento-facial disharmonies in my practice.

I believe it will be found that there are no easy winding paths that will reach that goal of permanency in retention of regulated teeth, or any sure paths which will not at times shatter the radical insistence upon long conceived ideals which have been and are regarded by many, as the most indispensable and unswerving principles of orthodontia.

If we have arrived at that stage in our progress when we fully appreciate the fact that permanency in the correction and retention of our regulated cases is the most important factor in orthodontia, and if it is a fact that in the advancing demands of bodily and other extensive movements which have increased the difficulties of retention, a large proportion of orthodontists are not fully satisfied with the final results in many of the most pronounced dento-facial malocclusions in their practice, then I think it is time to at least modestly ask whether it would not be well for us to stop and deeply consider some of the underlying principles of this subject of retention from the broadest possible viewpoint, and in doing so, to lay aside our petty partisan prejudices and get together as in a League of Nations, that the world may be benefited.

I think it will be admitted that our greatest difficulties in permanency of retention are found among the very cases which seem to be the most necessary to correct. I refer to those decided disto-mesial occlusal malrelations of the buccal teeth in Classes II and III in which are found those pronounced dento-facial protrusions and retrusions which we are always more than anxious to permanently correct.

In Class I malocclusion, in which by far the greatest variety of irregularities arise, nearly all are due to some one or more local causes which have attacked what otherwise would have been normal occlusions, and consequently, demand that the dentures be restored to their normal relations which nature intended they should occupy. In all corrections of that kind, permanency of retention can be assured, if a proper quality and degree of artificial retention is employed.

But with Classes II and III, the difficulties are greatly increased, because of the fact that the dento-facial malrelations pertain to the entire upper or lower

or both dentures, the buccal teeth as well as the front teeth, supposedly demanding according to the commonly practiced system, that the entire dentures be shifted disto-mesially to a normal occlusion, which can usually be accomplished with the intermaxillary force at almost any age.

If I may be pardoned in presenting a few previously published illustrations of former papers, I should like to briefly refer to some of the difficulties and failures of retention in my early practice of orthodontia as a specialty, which caused me to change my tactics in regard to treatment, and would have caused me to go back to the general practice of dentistry, had I not also discovered in this connection the retaining system which in its developed state has proved a Godsend in my practice.

In the winter of 1891 and 1892, I commenced the exclusive practice of orthodontia in Chicago. Previous to that, for nearly twenty-five years, I was engaged in the general practice of dentistry in Jackson, Michigan. During the later years of that time I had gained quite a reputation as an orthodontist



Fig. 1.

through papers which I had read before prominent societies. I had even given a clinic before the First District Dental Society of New York City on "The Angle System of Orthodontia," and I had also presented a paper published in the *Cosmos* in 1890 in advocacy of that system, as opposed to the system of regulating plates. It was because of a paper which I read before the Illinois State Dental Society entitled "Orthodontia," that secured me the appointment to the chair of Prosthetic Dentistry and Orthodontia in the Chicago College of Dental Surgery in 1890. During the many years of my early practice, and for a few years after I had started in Chicago, whatever the method employed for the regulation of the teeth, the main retainers were black rubber plates with nicely fitted interproximate extensions and often with German silver spurs and wire labial bows vulcanized into the plates to exert special retaining forces.

During the first year of my practice in Chicago, there fell into my hands four notable cases of dento-facial malocclusion, consisting of three pronounced

cases of upper retrusion, and one upper protrusion. Out of the demands in these cases, arose the practical disto-mesial application of the intermaxillary force, and the bodily movement of teeth. One of these cases in a supposedly finished state, was described in a paper read before the Chicago Dental Society, February 2, 1893. It was illustrated with plaster dental and facial casts, and with appliances, all of which were published in the following March number of the *Dental Review*. (See Fig. 1.) The other three cases in a more or less finished state were described in connection with this first case in a paper read before the International (Columbian) Dental Congress the following August (1893). They were illustrated with plaster dental and facial casts mounted in black velvet lined cases. Figs. 1, 2, 3, and 4, which will be referred to later, were published in the proceedings of the International Dental Congress of 1893, and in the *Dental Cosmos*.

In the rush to get these cases finished before the meeting, I was obliged to present two of them (Figs. 2 and 4) before the teeth were fully in place.



Fig. 2.

The Class III malocclusion shown in Fig. 1, represents the plaster casts of a girl thirteen years of age at the beginning of the operation in 1892. The dento-facial malocclusion was caused partly by heredity, but mostly by adenoids and long-continued habit of mouth breathing in early childhood years, resulting in a contracted maxilla and open-bite malocclusion. The treatment consisted in an expansion of the upper arch, a bodily labial movement of the upper front teeth, and a protrusive movement of the entire upper denture (the latter produced without my realizing it) through the reaction of the intermaxillary force which at the time was intended only as an auxiliary to a lingual movement of the lower front teeth, and for stabilizing the upper single-band anchorages. I speak of this here as a matter of history to show that I did not realize before its application in this case, the forceful influences of the intermaxillary elastics toward a disto-mesial movement of entire dentures. In cases which immediately

followed this, however, its mesio-distal action was planned for at the start and taken too much advantage of, which I found to my sorrow later, because it showed me the danger to permanency of retention by extensive disto-mesial movements with this form of force. Subsequently, I pointed this out in my early writings as a warning to other orthodontists whom I feared were overworking this method as I had done. It is that same danger of the overemployment of the intermaxillary force which I now again wish to warn you against in its relation to the subject of permanency of retention.

The second case, a Class III malocclusion also shown in Fig. 2, from the models of a girl fourteen years of age, was caused wholly by heredity. Her father and her brother were both afflicted with the same character of dento-facial malocclusion. The treatment, besides the bodily labial movement of the upper front teeth, consisted in disto-mesially shifting the dentures with the intermax-



Fig. 3.

illary force toward a normal occlusion. As I said before, this case was not fully corrected when shown at the meeting and as published in the proceedings. The figure illustrates the final position of the dentures several months later when a normal occlusion was fully established. Then commenced the fight for permanency of retention, as in the other case, but which I am now sure would not have been possible, regulated in that way.

The third case a Class II malocclusion shown in Fig. 3, from the models of a girl about thirteen years of age, was also due to heredity, evidenced by other members and relatives of the family, though perhaps enhanced over the labial area by the thumb-sucking habit. The treatment in this case consisted in opening the bite by an extrusive movement of the buccal teeth. This enabled a retrusive movement of the upper front teeth and ultimately the entire upper denture mainly with the intermaxillary force, and—what goes without saying—it

also produced a protrusive movement of the entire lower denture. When I had succeeded in closing the wide interproximate spaces between the upper teeth, I found that the facial outlines were so improved, I concluded to present this case in this condition at the Congress with the others; a thing I had not expected to do, because I regarded it as only about half finished at that time; my intention being to place the teeth ultimately in normal occlusion. The facial casts here shown are the same as those published with the Congress paper. The impressions for the final dental casts with the teeth in normal occlusion were taken about one year later. Unfortunately, I did not take a final facial impression.

I had learned by this time (1893 and 1894) that it was a very easy matter to shift dentures to a normal occlusion with the intermaxillary force. As I said before, I also learned some years later that this is a dangerous expedient in nearly all cases where an extensive disto-mesial movement is demanded. First, because of the improbability of permanency of retention, and second, because



Fig. 4.

in a large proportion of these cases the best facial results cannot be obtained in that way.

I have brought these three cases to your attention to give evidence that in every one of them, and in a number of similar cases that followed, I was unable to finally retain the dentures and the facial outlines in their corrected positions.

The fourth case, that of a girl thirteen years of age, shown in Fig. 4, was a Class I malocclusion. The retruded malposition of the upper incisors was due to a local cause, and when corrected with a bodily labial movement, it was easily retained, because no disto-mesial movement of the buccal teeth was required.

The reason for the many failures in permanency of retention in my early practice was partly due to the fact that we had no reliable system of retention at that time, and especially no appliances adapted for the retention of

bodily movements. The principles, importance, and difficulties of retention were in their infancy in orthodontia. And yet, though lacking as we all did in all those days, in a full appreciation of the importance and difficulties of retention, I had been employing for years everything that an ingenious mechanical mind could suggest in the form of retaining plates and appliances, but nearly always in futile attempts to retain the teeth in cases that were corrected by an extensive disto-mesial shifting of the dentures to normal occlusion, and with no chance for the retention of bodily movements.

After six or seven years of discouraging experiences in attempts to retain the corrected positions of all pronounced disto-mesial malrelations of the dentures, which arose from heredity, I gradually developed and adopted my present system of retention, and also stopped all extensive disto-mesial movements of the buccal teeth to correct upper retrusions and upper protrusions, except in the comparatively few cases whose peculiar conditions



Fig. 5.

demand the other treatment. But unfortunately, I did not adopt this method at that time in the correction of lower retrusions. I was, however, coming to the conclusion which I hold today, that all inherited, and even long acquired disto-mesial malinterdigitations of the masticating cusps present conditions that should be disturbed with great caution, if at all, except to adjust the occlusion, and especially with no extensive distal movement of the buccal teeth, upper or lower, except in those cases in which the first permanent molars have drifted forward through premature loss of deciduous teeth, or from other local causes.

Since that time, all extensive retrusions of the upper denture in Class III malocclusions which arise from heredity, have been corrected in my practice—not by moving the entire upper denture forward—but by a bodily labial movement of the front teeth only, thus opening spaces in the bicuspids

area for the insertion of artificial retaining teeth. (See Fig. 5.) In these cases, if the lower dentures are protruded, they are corrected through extracting the first bicuspid preferably, except when the second bicuspid or first molars are badly decayed.

In accord with these same principles in the correction of all inherited upper protrusions of Class II, in which the lower dentures are in normal dento-facial relations, I have for years in my practice extracted the first upper bicuspid preferably, followed as shown in Fig. 6, with a retrusive movement of the six upper front teeth, which commonly is about the only movement to speak of that is required; the buccal teeth frequently being already in an inherited or established malinterdigitating occlusion, and quite as useful for masticating purposes as a normal occlusion. I adopted these principles in my practice, because I found they enabled me to give to my patients good masticating occlusions, a correction of deformed facial outlines, and a permanency of retention which I could not obtain in any other way.

Previous to this change in my practice, in nearly all cases of Class II in which there was a pronounced protrusion of the upper with the lower normal,



Fig. 6.

there was an endeavor to place and retain the teeth in normal occlusion with the intermaxillary force, as shown in Fig. 3, but frequently with a most unsatisfactory dento-facial result, because the upper was only partially corrected, and the lower was abnormally protruded to the same extent or more, leaving the patient with a prominent mouth, indicating a partial bimaxillary protrusion, and what was worse, impermanency of retention.

There is another division of Class II malocclusion which is quite as distinctive and perhaps more common than upper protrusions, and though having the same general occlusal malrelations of the dentures, it decidedly differs from it in facial outlines and demands of treatment. The extreme type of this division as shown in Fig. 7 is characterized by a pronounced retrusive malposition of the entire lower denture in relation to the mandible and to a normally posed or nearly normally posed upper denture, and commonly it is associated with a closebite malocclusion. Facially, it is usually characterized by a decided retrusive deepening of the labio-mental area in relation to the chin and a normal or nearly normal position of the upper lip.

Between the two extremes of upper protrusion and lower retrusion of Class II, lies every gradation of dento-facial relation within the class, the composite of which is a moderate upper protrusion in connection with a moderate lower retrusion.

I am particular to fully outline this character—which no doubt is familiar to you—because it has always been, except in recent years in my practice, the *bête noire* of all my efforts in permanency of retention; and I thought possibly it might have been the same with you. With me, the main reason for this lengthy series of failures in this malocclusion, was because I was loath to admit that this particular character could not be permanently corrected through the normal occlusion route as shown in Fig. 8 until one ultimate failure after another continued to stare me in the face. In other words, I treated it along the same lines which characterized my very early practice in correcting upper retrusions, believing that pronounced lower retrusions also required an extensive protrusive movement of the entire lower denture—of course, with a bodily labial movement of the front teeth. Then commenced the usual unsatisfactory endeavor to retain the disto-mesial relations with a moderate continuation of the intermaxillary elastics. But



Fig. 7.

always or nearly always, with the same ultimate heart-rending result of seeing one case after another return to its former malocclusion and facial imperfection, after the retaining appliances were removed.

The illustrations here shown, represent only a very few of the many cases with this special character of malocclusion, which were corrected in my earlier practice by placing the dentures in normal occlusion. Nearly all cases of this character that were corrected in this manner, and for which treatment commenced in a number of instances at eight and ten years of age, I regret to say, have drifted back to their former malpositions; though for years I continued a moderate application of the intermaxillary elastics.

At least, about five or six years ago, I fortunately had the sense to adopt the same principles of treatment in the correction of lower retrusions as that which for years had enabled me to permanently correct upper retrusions. In this proposed method of treatment there is no attempt to extensively change the disto-mesial relations of the buccal occlusion, except to correctly adjust the linguo-buccal and disto-mesial interdigitation of the cusps. The main treatment consists briefly, in a bodily labial movement of the lower incisors, carrying forward

the cuspids and first bicuspid, partly through the reaction of the fulcrum arch bow, thus opening spaces for the insertion of artificial retaining bridge teeth, between the bicuspid. The separation of the bicuspid, or of any teeth for the insertion of artificial teeth, or the closing of spaces where teeth have been extracted, is always accomplished in my practice with bodily movements, enabled through the advantages of rootwise extensions—fully published in other places.

The retention of the bodily labial movements of the incisors, and the inclination or the bodily movements of the cuspids are secured with the usual six band retainers supporting the lingual iridio-platinum springs bars: A description of this is also fully published. When this appliance is finally removed after being worn about two years, the teeth are prevented from returning to their former malposition because of the sustaining force of the bridge dentures. This method results in an equally artistic correction of

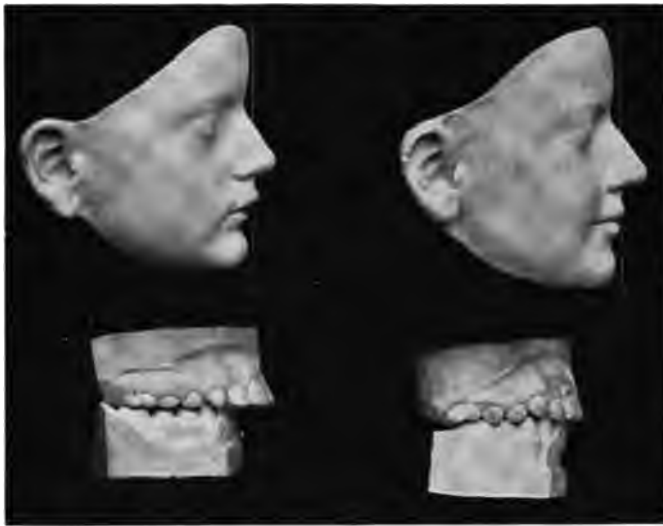


Fig. 8.

the facial outlines, and insures permanency of retention without materially changing the inherited occlusion of the buccal teeth.

Two cases of twin brothers commenced at twelve years of age. I will now show to illustrate this principle. These cases were practically exactly alike, being typical retrusions of the lower dentures in relation to the mandible, with closebite malocclusions: therefore, they presented a most favorable opportunity to test the comparative value of the two methods of correction. That shown in Fig. 9 was corrected by shifting the dentures as formerly practiced in these cases, to a normal occlusion with the intermaxillary force, being careful to produce a much greater mesial movement of the lower than a distal movement of the upper. That shown in Fig. 10 was corrected, as shown, by a bodily labial movement of the six lower front teeth; the first bicuspid being carried forward by the force of the fulcrum bow of the apparatus, and through the advantage of rootwise attachments on the bicuspid.

Now that these spaces are permanently secured in this case with extra bridge bicuspid there can be no doubt of permanency of retention. Whereas in the other cases, like many others corrected in the some manner, permanency of retention cannot be assured.

It is not usually a difficult operation to shift disto-mesial malocclusions of Class II—in protrusions of the upper and retrusions of the lower—to a normal occlusion with the intermaxillary force, providing there are no pronounced complications, and particularly in those cases where an evenly disposed reciprocal force may be employed as often arises. Neither is it beyond the reach of most orthodontists to obtain beautiful results at the close of operations in this particular type, by this method, even where considerable complications arise. But that is not the whole question which should be considered in the advance practice of orthodontia of today. Many



Fig. 9.

of these cases in my practice, and I daresay hundreds of similar cases in the practice of this specialty, have not retained the perfect positions shown by the finished results, even after being artificially retained for two years or more with the most approved retaining appliances. Why? Because the entire upper and the entire lower dentures have been moved backward and forward of their inherited positions in the jaws, and particularly because there are no stationary means of anchorage by which they can be reliably held in the corrected position until nature can establish their permanency of retention which I doubt would ever be possible.

I believe that a very large proportion of the failures in retention among the orthodontists of today is not due to the inadequacy of the retaining appliances they have employed, as much as it is to the radical application of the system which demands that all regulated cases must be placed in normal

occlusion. This must frequently place the teeth in relative dento-facial positions which no kind of appliances or plates that ever have been, or ever will be invented, will prevent them from returning partially or wholly to their former malpositions, after the artificial restraint is removed.

Before leaving this subject, I must beg your indulgence for a few moments in a little wider consideration of the radical formula that "in all cases the dentures should be placed in normal occlusion without the loss of a single tooth or its substitute." I believe that the day is not far distant when that teaching and its invariable application will be regarded as one of the great retarding forces of orthodontia, and in its place will come a rational scientific common sense orthodontia, stripped of all impractical imperialistic idealisms.

I believe that this formula and its impossible assertions in regard to its correction of the facial outlines, has been in the past, and is today overworked by hundreds of good men in orthodontia to their own detriment and the detriment of their patients.



Fig. 10.

As one of the many illustrations of this that has fallen under my observation, a family of very moderate means consulted an orthodontist of high reputation, of conscientious ability, and a friend of mine, in regard to the correction of their son's teeth, who at that time was 12 years of age. The prominent feature of the case was deforming maleruption of the upper cuspids, in a mouth which distinctly indicated an inherited upper protrusion, shown by the mesial malocclusion of the upper buccal teeth in connection with a normally posed chin and lower lip, and proven by a similar malocclusion in one of the parents. The straining force of the upper lip—after a premature loss of deciduous teeth—had caused the incisors to drift back and nearly close the spaces for the normal eruption of the unusually large prominent cuspids. One of the complications of the case was a decayed and broken down condition of the right lower first molar, in which the pulp had

long since died and was in putrescent condition, and had previously given trouble from symptoms of an abscess.

I was told that the treatment outlined by the said orthodontist was to place the dentures in normal occlusion and restore the molar with a crown. I think you will agree with me that this is the same principle of treatment that has been strictly followed in the past by many orthodontists, and I believe it unfortunately is still followed by many who earnestly believe it to be the true principle in the correction of all malocclusions.

The case fell into my hands because of the prohibitive fee of the said orthodontist; this led the father to inquire if it could be corrected at the college. It is needless to say that the extraction of the two upper first bicuspid was ordered by me. This gave very little more room than necessary for the eruption and alignment of the cuspids. The diseased lower molar was also extracted, as in my opinion, no capable dentist in these days would attempt to save it.



Fig. 11.

With the exception of appliances for the bodily mesial movement of the second molar to take the place of the extracted first molar, the case no doubt would have corrected itself without any regulating appliances, if given time under ordinary circumstances. It was hastened with an upper apparatus having a light resilient arch bow for the alignment of the cuspids, and with the intermaxillary force to aid in the mesial movement of the molar, and adjust the occlusion.

Fig. 11 shows the facial and dental models of the case at the beginning and completion of the operation. One can see by a careful study of the facial outlines at the beginning, that the lower denture was not retruded dentofacially, and therefore, had the upper cuspids erupted in alignment it would have been purely an upper protrusion. Consequently, to say nothing of the diseased lower molar, the only way that the facial outlines could have been corrected would have been by a retrusive movement of nearly the entire

upper denture fully the width of a bicuspid. But what would have been done probably, as in many similar cases, both dentures would have been moved disto-mesially, possibly with more of a protrusive movement of the lower denture than a retrusive movement of the upper, inevitably resulting in a partial bimaxillary protrusion of the upper and lower labial area.

Fig. 12 shows the case from the occlusal aspect.

The whole subject of orthodontia in its relation to the treatment of those pronounced dento-facial protrusions and retrusions of Classes II and III— to say nothing of the deforming bimaxillary protrusions in Class I— resolves itself, it seems to me, into the question: Which is the higher professional attainment for our patients and ourselves, to produce for them in the regulation of these cases, an absolutely normal occlusion of the dentures with the improbability of permanency of retention, and the possibility of an ultimate deforming dento-facial imperfection; or, on the other hand, to produce an occlusion of the dentures which fulfills all the requirements of healthful



Fig. 12.

mastication, and results in a correction of the dento-facial disharmony; with a permanency of retention, which cannot be equally assured in any other way.

Finally, I hope that no unthinking mind will misconstrue the objective principles of this paper, or imagine for a moment that it refers to any dental irregularity, however jumbled or malposed, which can be perfectly and permanently corrected without extraction. Because it has reference only to a comparatively small part of the malocclusions which arise in practice, but whose correction and permanency of retention are of the greatest importance, because they produce the greatest dento-facial imperfections and deformities which the orthodontist is called upon to correct.

Furthermore, I do not wish to be understood as assuming that I follow the outlines of this treatment in every case, or that I invariably secure permanency of retention with my very best efforts, so much depends upon the forceful influences of heredity and a perfect cooperation on the part of the patient.

In the short time allotted to a paper it is impossible for me to even touch upon many coordinate subjects in causes, diagnosis, and technics, which I fully realize are of the very greatest importance to a successful application of the principles I have outlined.

In giving you this brief synopsis of many years of clinical experience in the treatment of certain dento-facial malocclusions which I have found the most difficult to permanently retain, it is hoped that the practical application of these principles will be of the same benefit to others as it has been to me.

DISCUSSION

Dr. F. M. Castro, Cleveland, Ohio.—The essayist has well said that the retention of regulated teeth is indispensable to the successful practice of orthodontia.

There are many factors that enter into the question of retention, some of which are, diagnosis and treatment, age, function, harmony in size of the arches, occlusal relations, interproximal contact, etc.

When a case presents itself to the orthodontist, a thorough, careful, and sane diagnosis should be made, anticipating in so far as possible the ultimate permanent retention. The diagnosis should consist in accumulating all data that is pertinent to the case, of a just and fair consideration of the same, and a decision made in accordance with good common sense and from a practical and operative standpoint. Ideals must never be made subservient to methods, or procedure, detrimental to the best interests of the case, but empiricism should be frowned upon.

The treatment should be consistent with the requirements of the case, no more or no less. Overtreatment should be religiously avoided. The reasons are obvious. The kind or types of appliance to be used are only incidental, provided correct principles are embodied within them, and they are properly managed, otherwise the final or permanent retention becomes a serious question.

Dr. Rogers has been able to successfully correct and retain certain types of malocclusion without the use of any appliance. When this can be done, it is much to be desired.

The adjustment and operation of the appliances is important and significant. Great care should be exercised not to injure the periodontal tissues, or to produce and maintain traumatic occlusion over a long period. The physiologic processes should not be disturbed by the careless or unscientific application of force. It is my personal opinion that the majority of failures in retention can be attributed to faulty diagnosis and treatment.

Diagnosis, treatment, prognosis, and retention are covered almost entirely by the age at which orthodontic interference begins.

The question of extraction is practically never considered if the orthodontic operation is begun early enough. The establishment of occlusion relations and the permanent retention becomes comparatively very much simplified in such cases.

The function of the mouth and teeth should be kept to its highest degree of efficiency during the entire operative and retentive period. The mouth and teeth should be kept clean and healthy. These are fundamental principles without which the greatest success cannot be attained either in treatment or retention. Any appliance or treatment that interferes with this plan must be absolutely avoided. In this connection I wish to state that a retaining appliance should allow of mobility of the teeth, should consist of as few bands as possible, and should be of the removable or semi-removable type in all cases where indicated or where possible to be used.

The bands should be removed occasionally and left off for a few days in order to give the teeth a chance to breathe and to adjust themselves more or less to existing conditions. The question has never been satisfactorily settled as to whether or not the enamel of the teeth is rendered more susceptible to the attack of microorganisms when bands have been worn for a long period, during which time the teeth have been deprived of their natural environment.

Some authorities claim that the enamel can only be kept in a normal state of health and resistance by being bathed in saliva, arguing that since it is a normal physiologic condition it must, therefore, be a beneficial one. I think incidents have been called to the attention of most of us where the resistance or vitality of the enamel was apparently lowered after the removal of bands and appliances that had been worn a considerable time. Research and clinical observation of this problem would be most appropriate and beneficial.

The ultimate success of retention, whether controlled by natural or mechanical forces, will depend finally, upon the establishment and maintenance of function.

The fact that harmony in the relative size of the arches must be established as a principle of retention is not debatable, neither is its necessity unknown to any of you. However, the manner in which this may be done is debatable and has a most decided bearing upon the retention of certain cases of malocclusion, some of which has been pointed out by the essayist.

There are certain fundamental principles in orthodontic practice upon which we can all agree:

First: To remove the cause or causes when possible.

Second: To render only such orthodontic service as is necessary for the correction of a given case.

Third: To move as few teeth as will bring about the desired result.

Fourth: To influence teeth to erupt into correct positions rather than move them into such positions after eruption.

We also know that occlusal relations established by natural forces and maintained for several years although abnormal mesio-distally, will always be retained as such.

These principles are pertinent to the question of retention and are concerned in the treatment and retention of certain cases presented by the essayist.

With these things in mind then, the question naturally arises, whether or not, considered both from the standpoint of treatment and retention, it is ever advisable or permissible to extract permanent teeth in the correction of malocclusions. Pardon me, but I do not, at this time, intend to discuss this momentous question. However, I do wish to call your attention to the fact, that Dr. Case has demonstrated by the presentation of several cases that his diagnosis and treatment was based upon sound judgment.

It is needless to remind you of the great importance and of the utter dependence of retention of the teeth upon the occlusal relations. It matters not by what man or method, or whether by witchcraft or science, the case be treated, if certain definite incline occlusal relations are not established, the case will be doomed to failure. Mechanical retention will avail nothing.

The conservation of approximal contact is also necessary to the final retention. Loss of contact or abnormal contact will render the adjacent peridental tissues susceptible to disease because of injuries to them from the excursions of food in the act of mastication and from the further fact that severe traumatic occlusion may be produced by food packing between the teeth. If this occurs, and is not corrected, the retention, in fact the entire orthodontic operation, will ultimately be a failure.

I do not wish to discuss the question of heredity as related to the problem of retention, except to say that in the light of present knowledge I do not believe it has very much influence. I do not think that any particular type or class of malocclusion is due to heredity any more than are other physical abnormalities, such as, for instance, club-feet, or bow-legs, but I am almost convinced that practically all cases of malocclusion occur after fecundation or fertilization of the cells, and are the victims of circumstances during development, which includes the congenital as well as the preadolescent period, the perversions being due principally to function and environment.

I have purposely avoided the discussion of appliances and technic, because, as I said before, they are, to my mind, only incidental when compared to the real fundamental principles of retention.

Dr. Case has presented many things that give us food for thought. He has very kindly come here and given us of his valuable time and knowledge, and I wish to take this opportunity to personally thank him. I also wish to thank him for sending me a copy of his paper several weeks ago.

Dr. C. A. Hawley, Washington, D. C.—To many of the things Dr. Case has said in his introduction in regard to the necessity of permanent retention I can heartily agree. To the intimation or presumption which is carried through the first part of the paper, that the work of a large number of the leading orthodontists of the country is failing because of the failure of their retention, I most emphatically protest.

He quotes the opinion of a "prominent New York Orthodontist" in support of this implication that much of the work of orthodontists is a partial failure, yet neglects to quote the authority on which this statement is made. It seems to me that if this statement is to have any weight at all the name of the author should be made known. It places every prominent orthodontist in New York under the suspicion that he considers his retention a failure, and we do not know whether it was a chance remark in regard to some feature of his own practice or the serious statement that is implied.

Considerable has been written in the last few years about retention—about the difficulty of retaining details of the treatment—as for instance, the exact overbite, the exact width of the arches, the rotation of certain teeth, etc.; but nowhere have I seen an intimation of any considerable failure in retaining the main, important features of the treatment and nowhere have I seen any references to failure in retaining the mesio-distal relation. I have, since receiving this paper, asked a number of prominent orthodontists, whether they were having any especial difficulty in retaining the mesio-distal relation and they all replied "No."

Does the failure to retain all the details of many cases mean that the work of orthodontia is a failure? I do not think so. In fact, I believe that the majority of orthodontists have been able to correct and retain the main, important features of their treatment and that their work is a success. I do not believe that the practice of any branch of dentistry or surgery has so large a percentage of satisfied patients, and the universal success of the majority of orthodontists in the country all testify to the success of orthodontia.

Dr. Case has for twenty-five years recommended and practiced the extraction of teeth in a certain number of Class II and Class III cases, or cases where the mesio-distal relation of the teeth has not been normal. What has been called by Dr. Case and others, "the New School of Orthodontia" has protested against this practice as unnecessary. Dr. Case seems to think he sees in the recent discussions of retention, and in the opinion he has quoted, signs of failure in retention of the mesio-distal relation, and advises that the whole trouble is in the treatment. In this I believe he is entirely mistaken. The failures in retention as quoted, do not refer to these classes of cases more than any others, and in the instances where it does the trouble is becoming more clearly understood and it does not, so far as I can see, relate to the manner of treatment. I think we are finding some reasons why the retention fails and some of these have been previously pointed out.

I believe the teaching of extraction leads to great harm in the hands of inexperienced men. For example, if you will pardon personal reference, I will say that I heard one of Dr. Case's first papers twenty-five years ago and was much impressed by it. It was shortly after I graduated (ten years before I took up the study of Orthodontia seriously) and I went home and attempted to treat a case in that way. I find that I still have photographs of the face masks (Figure A). This treatment was a mistake and not an example of what Dr. Case would call a correct application of his principles, but a mistake young men frequently make in trying to follow the teaching of extraction. This appearance of the obtuse angle between the nose and upper lip has been with me like a nightmare ever since, and has checked any desire to adopt this plan of treatment unless I could be sure of the results.

During all the seventeen years of my practice of Orthodontia, I have watched for cases in which I could be certain that I could extract teeth as Dr. Case recommends and be sure of getting a more desirable result than I could by retaining all of them; and I have never yet found one. Perhaps I could not distinguish them, but I never have since that time extracted teeth in such cases.

I have taken a great many face masks, but have long ago abandoned them, because I do not believe they tell the whole story. They do not give the same correct view of the form of the head and expression of the face that is obtained by photographs.

As to the matter of inheritance, Dr. Case is positive in his statements that he treats in this way only those cases that are inherited, and he is very sure that he can tell an inherited case.

So far as his treatment is concerned, it has been my experience that there has been no more difficulty in treating cases in which the father and mother had the same deformity than it is in a case that they did not, and it is rare to see this deformity in both.

Dr. Casto.—Do you call that case inherited or not?

Dr. Hawley.—At that time, I could not tell, and I cannot now. I will say that in the opinion of scientists an abnormality cannot be inherited through one generation. I have looked upon it in this way, that in case we did find the same abnormality, the same disto-occlusion in the child (as in the father and mother), the environment was the same and the conditions were the same that produced the malocclusion, but not that it was inherited, or that that fact was any obstacle to its treatment. It seems to me, if we consider the question of inheritance, we must also consider the fact that, as Dr. Gregory says, for twenty millions of years mammals have inherited normal occlusion; and would there not be more likely a tendency to maintain the normal occlusion than abnormal occlusion? It seems to me that is a far stronger argument.



Fig. A.

Coming down to a later time, we will say for ten thousand years, the normal human being has had a normal mesio-distal relation; and is it not just as reasonable that inheritance would tend strongly in that way, instead of, as claimed, that in one generation from father to the child, you could have an abnormality handed down that is going to persist?

Dr. Case states that we had better come to the conclusion that distal occlusion is for all practical purposes as good as normal occlusion. Is it? In a normal occlusion the strong lingual cusp of the upper molar works in the middle of the sulcus of the lower first molar, as a pestle in a mortar. There is great strength of mastication in this normal occlusion; in distal occlusion the strongest cusp works between the two teeth. If there is some reason why through all these thousands of years normal occlusion has been inherited, is it not because normal occlusion is more efficient for mastication?

In the cases where I have had difficulty in maintaining the mesio-distal relation, it has been my tendency to seek the cause, and many times I have found it and it can be readily pointed out.

I have one case that I brought with me that I can use for illustration. I brought it to show primarily that it is a partial failure after three years retention after appliances were all removed, and to show the reason why.

This child was about twelve years of age, was treated for about two years and a half, retention was used for two years, and the mesio-distal relation seemed to be well established;

then the girl went away. She left town for a boarding school and was gone for three or four years. She is now twenty years of age, and came back a few weeks ago with this condition (Fig. B). You see the mesio-distal relation is not being perfectly retained. Neither the father nor the mother of this girl has disto-occlusion, so it could not be inherited.

When I took models and made a careful examination, I found the canines and the first premolars had contracted about one-sixteenth of an inch, so that it was impossible for the mandible to close forward in proper position. I put on a lingual appliance with little finger springs, and in about three weeks opened the arch in this region, and without intermaxillaries at all, it simply moved back to a normal mesio-distal relation. Upon taking radiographs of the upper third molars I found them both impacted. It seems to me that possibly this is a cause for this failure, and I am not discouraged in this case at all, as I fully believe that with a removable retention and with the removal of the impacted molars, I will be able to retain the case permanently.

I show this case because I believe it illustrates the reason why many Class II cases tend to return. Obviously as long as the arches are kept in the normal relative sizes the patient cannot bite in distal position. The teeth will not occlude in that position; but a fixed retainer is used and generally it is removed too soon. The upper arch commences to contract and the lower teeth seek a distal position to find a more comfortable occlusion.

It is largely a question of interference. A slight interference will throw a case into distal occlusion. I have had a thick ridged band on a lateral incisor or the tilting of a sec-



Fig. B.

ond molar throw a case into distal relation. If we carefully look for the cause in the cases that have relapsed, we will find some interfering cusp or other cause that has been overlooked.

Fig. C shows one of the faces before treatment and after. Dr. Case recommends extracting "all inherited and even long acquired disto-mesial malinterdigitations of the masticating cusps." This was a well-established distal relation. It seems to me that the extraction of the upper premolars would be likely to carry back the upper lip, and even with the retention of all teeth there should not be possibly attempted any recession of the upper lip. While possibly it takes longer, and I will admit many of these cases take longer and more persistent treatment, yet it seems to me worth while, and if it were my daughter I would take years and years rather than risk the extraction of the teeth.

As for Dr. Case's proposition to open spaces for a bridge tooth, in the light of the revelations concerning the life and stability of anchor teeth in bridge work, even though they be vital teeth, the evidence produced in examination of bridge work shows that in a short time the anchor teeth will be crippled by changes in the supporting tissues or devitalized.

Here is another set of models of a case I treated a number of years ago (Fig. E). Unfortunately, I have left the slide at home showing the mesio-distal relation, but this was a distocclusion case. This case was treated for I do not remember exactly how long, maybe two years, and then was retained with fixed retainers, and all the retainers had been off for over three years. The patient came back two or three weeks ago, and this was what happened. The

model on the right (Fig. F) shows the upper arches in their original position. The middle one is the relation in which I placed it, or as it was when I took off the retention, and the one to the extreme left is the condition in which it is now.

It is a type of failure to which I have previously called attention—not the relapse of the mesio-distal relation, because the mesio-distal relation has remained perfect. Even in the present state of this case, I do not feel that treatment is a failure by any means.



Fig. C.



Fig. D.

To go further, why might it be called a failure? In the first place, I provided a fixed retainer which was removed at a definite time, and neither I, nor any one else, could tell whether that was long enough. Then when I radiographed the third molars in this case I found them all impacted. It is my impression that it is the crowding of the eruption of these third molars that has been responsible for a partial relapse in retention, and I fully believe that with the removal of the third molars and with a little further treatment and a removable retention this case will be completely successful.

I am not going to quarrel with any one, least of all with Dr. Case, or say he has not the right view in some cases, the mature cases, which have reached the age of fifteen or six-

teen or more. He may find it expedient and better for him to extract premolars, maintaining the procedure he has described, and yet some of the cases in my own experience that have responded most readily to the correction of the mesio-distal relation have been some of these older cases. I have been astonished at it, but it is true. When the arches are widened and placed in their normal harmonious relation, there has been no great difficulty in maintaining and correcting the mesio-distal relation.

Where I quarrel with him decidedly is in his broad assumption that no one is succeeding in retaining Class II and Class III cases.

There is another part of the paper that is important. Dr. Case speaks of a form of retention which he has used for twenty-five years with uniform success, and he wonders why we have not all taken it up. I am not going to speak for anybody else; I am going to be frank and tell him why I have not taken it up. Dr. Case intimates in his paper that the reason this has not been universally taken up is because it is difficult of construction. I do not think that is true for one moment. I do not find that this is particularly difficult of construction, and we do dozens of things in Orthodontia that are far more difficult than the



Fig. E.



Fig. F.

construction of this retainer. I have seen several of these that Dr. Case has placed in the mouths of patients, and they are certainly made beautifully, and his technic is fine. I have made probably half a dozen of these retainers, and I thought I succeeded pretty well.

Now, the reason I do not like them is this: They will get out of order; the cement will wash out between the lingual surface of the retainers and the teeth, and this makes an element of danger. I have never had decay in these cases occur between the teeth, but I have heard of a great deal of trouble with decay of the teeth occurring where these little points went in between the teeth. But there are other greater objections to this retainer in my mind. It holds the teeth too rigidly. I do not believe that absolutely rigid retention of the teeth is the best thing for them. They must have more individual movement.

The other objection I have to the retainer is that it must be worn (with bands on the teeth) for a definite length of time. Dr. Case says generally two years, and then all removed and trust to luck for the results. No man can tell just the time when you can remove any fixed retainer, and I do not believe a great many of the cases will stay after being retained

with a rigid retainer such as this for two or even three years. For that reason, in my effort to correct some of these details of retention, I have used another type of retention with which you are all familiar. With the removable retainer, you can also hold the bodily movement of the six anterior teeth and, in fact, produce bodily movement with it; and is it not safer? There is no definite time when you take it off and say, "Well, we will trust to luck for the result." While the retainer of Dr. Case is perfectly satisfactory to him, it seems to me to have very vital objections.

The question of whether this removable retainer is efficient depends largely on this one question: Can you retain a rotated tooth with it?

Here is a case (Fig. G) that was treated in which there were rotated anterior teeth. There never was any retention upon this case except a removable retainer, and that has been retained for three years, and I have seen the patient four times in that time. Would I be safe



Fig. G.



Fig. H.

if there had been cemented bands on the teeth in that time? Directions were given that I should see the patient oftener, but like many other patients, she did not come. There are no decayed teeth, and the rotation was maintained.

Here is another case (Fig. H) that never had a fixed retainer, but a removable retainer, and has been retained for a year and a half. I have seen this case more frequently. There was a period of six months when I did not see the case. It seems to me, that if rotation can be retained and bodily movement can be retained with a removable retainer, without the danger of decay of the teeth from a dozen bands, and without the danger of decay between the teeth, it is a much better procedure than to use such a complicated structure as the six band retainer.

Dr. Case, in closing his paper, states that this treatment which he has advocated here is only used in his practice in a small percentage of cases, yet, he pleads for a re-

vision of the methods of practice of other orthodontists because it has been stated and acknowledged that in cases *not confined to the small residue which he has treated*, absolutely ideal occlusion is not established. I want to say again that I believe, so far as I know from my communications with orthodontists, the majority of their cases of treatment of disto-occlusions or mesio-occlusions have been successful without the extraction of teeth.

Many cases give trouble; there is no question about that, but we are finding out more and more the reasons why. Many things can be improved and I believe will be improved, but I am sure that the majority of orthodontists have no tendency to turn in the direction of the method Dr. Case has described.

Dr. J. Lowe Young, New York City.—I think Dr. Case is familiar enough with the Society of Orthodontists to appreciate that when he comes before us to present a subject for discussion that the discussion is to be frank and open and that there is nothing personal in it; the object being the promotion of the Science of Orthodontia.

In my judgment, Dr. Case has been very consistent in what he has presented here today. He has outlined where he would open up spaces and put in extra teeth in certain few cases. He has, however, made a few statements which I think are not fair, and one statement in particular that I object to, is that lower teeth in disto-occlusion in relation to the upper are as efficient as when they are in normal occlusion. That this is not a fact can be easily proved by careful examinations from the lingual view of casts of such cases.

I would like to suggest to the essayist that when he prepares another paper using lantern slides showing plaster casts that he have pictures so made as to be readable. Those he has used for years have been so small it was absolutely impossible for any one to accurately follow his description of the cases in point. We have had to take the whole thing on faith.

I would not have the temerity, from what the essayist has shown on the screen today, to say he was wrong in many of these extractions because of the impossibility of judging the cases from such small pictures as referred to above. I believe, however, from the bottom of my heart, that in advocating the extraction of teeth he has done more harm to the cause of orthodontia than he has done good.

I do not mean by this that he has practiced wholesale extractions and to have done particular harm by that means, but he must realize that the dental profession for generations have been keen to remove teeth with the false idea that this simplifies treatment. I feel sure he realizes when he has extracted teeth he has not facilitated treatment. He has done it with an entirely different thought. He has done it because he has felt that in certain peculiar cases he would get a better facial or final result than if all the teeth remained in the mouth. It has not been a question of expediency, but the dental profession does not get this phase of it. They say "Dr. Case extracts teeth," therefore it encourages them to extract teeth and they do it in countless cases where I am perfectly satisfied the essayist would never think of resorting to such a method of procedure.

The case shown by Dr. Hawley I am sure substantiates this argument. It is very doubtful whether Dr. Case would advise the extraction in this case, but Dr. Hawley got the wrong viewpoint.

Two weeks ago a patient was referred to me by a dentist with a very simple Class I malocclusion. The space for the upper right canine was almost closed due to premature loss of the deciduous teeth. The dentist advised that the teeth be removed; stating that the removal of the first premolar, which had just erupted, would simplify treatment. This I absolutely refused to do for a child ten years of age, so they decided to take the other fellow's advice and have the tooth removed with the result that this child will limp through life with a mutilated set of teeth due to the dentist looking at things from the wrong angle. Now I know Dr. Case would not think of extracting in such a case.

Dr. Thomas L. Grisamore, Chicago.—I hesitate to take the time of the Society because I know you are behind with the program. However, I want to compliment the essayist upon this most excellent paper. It gives me great pleasure to inform this body of orthodontists, that what little success I have achieved in the practice of orthodontia, has been very largely due to the teaching and influence of Dr. Case.

When Dr. Case presents a subject to the dental profession, I know it is based on his practical experience, and the theories presented have been thoroughly tested in his own pri-

vate practice, and we can rest assured that in this way he obtains the best possible results. I have heard him teach for years, and he does not only teach what he believes and what he practices in his own office, but he teaches the things that other men practice and teach. Furthermore, he does not hesitate to adopt other men's methods in his private practice, if by so doing, there is a possibility of serving his patients to a better advantage.

About thirteen years ago, when I first became associated with Dr. Case in teaching, he said to me: "You will live to see the time, but I never will, when the orthodontists in this country will advocate and practice the bodily movement of teeth and the occasional extraction of a tooth during orthodontic treatment." Dr. Case, himself, has not only lived to see the orthodontists practice bodily movement of teeth, but to see a great many efforts put forth, trying to develop some simple appliance to produce this movement. He has also seen practiced, and heard papers read before this organization advising, the extraction of teeth for orthodontic purposes in certain classes of malocclusion.

Regarding what Dr. Hawley has said, I am afraid there are orthodontists in this country who believe that Dr. Case removes teeth, or inserts artificial teeth in every case in which there is a mesio-distal malocclusion. I firmly believe that if any of you would go to his office, and look over his cases for the past ten years, you would find the percentage of cases in which he has extracted or inserted artificial teeth, would not be greater than that of the majority of orthodontists who have been practicing for twenty years. He does not extract, neither does he insert artificial teeth in all these cases. He does not extract any more teeth than many other orthodontists, but he talks more about it and it appears as though he does. Dr. Case does not extract teeth except to a limited extent, and if you will read his papers carefully, you will find he says so.

The attitude of the dental profession, as well as the orthodontists all over the world toward Dr. Case, is sufficient answer to Dr. Young's remark regarding the influence of Dr. Case's life work. He teaches students that in a very large percentage of cases it is not necessary to extract teeth; he teaches them that in practically all cases they should put on appliances and try to produce normal occlusion before they resort to extraction. He teaches them to try to bring about normal occlusion, and if the dento-facial area is out of harmony with the immovable features of the face, then it is time to extract. You will also find that in cases where he has taken out teeth, there was a decided protrusion of the entire denture, and where he has inserted teeth, there was a decided retrusion of the entire denture, and in practically all of these cases the patients were older individuals, most of them between eighteen and thirty years of age.

He has practiced orthodontia much longer and treated many more cases of mature years than most of us. I am sure you would be surprised, if you should go through his records, to find the number of cases he has treated between twenty and thirty years of age. You will find these are the cases in which most of his extraction or insertion of artificial teeth have been done. This method is seldom resorted to in younger individuals.

Dr. Case (closing).—It seems to me, much of the discussion that has taken place has been quite foreign to the paper.

I am indebted to Dr. Casto for giving the general principles pertaining to retention, as I felt that I could give no more than a cursory review of principles which pertain strictly to my subject.

My paper pertained to a very small number of cases that we find in practice, i. e., extensive protrusion and extensive retrusion of the upper and lower dentures in Classes second and third, which arise from heredity.

I should like to have the time and ability to speak extemporaneously in regard to the question of the laws of heredity, and how I happened to know that this or that case is an inherited case, but there is not time, and in fact, it is something that requires a broad understanding of some of the principal laws of biology.

There is one point I want to mention in regard to Dr. Hawley's discussion. When a man illustrates a single case that he has corrected or attempted to correct himself, and it has proved a failure, and sets that case up as an example and argument against an extensive and successful practice of any man whose methods differ from his own, it seems to me very absurd, with all due respect to my dear friend, Dr. Hawley.

I can see how after extraction of the premolars, for instance, followed by a lingual inclination movement of the front teeth, that any one would produce exactly the same result he has shown. That is what I often do in the first retrusive movements of the six front teeth. I have case after case showing the difference between the proper bodily retrusive movements of the roots of these same teeth and their inclination retrusive movements. He has not moved the roots, and consequently he has left a protrusive condition at the upper apical area.

Dr. Case was asked to continue his discussion in writing, to be published with the proceedings.

Dr. Case's further remarks in writing: Since a careful reading of the stenographic report of the discussion of my paper, I am more than ever convinced that the real claims of my paper were not specifically discussed, notwithstanding the carefully prepared length of the discussion which wandered into many by-paths pertaining to the general practice of orthodontia, many of which I did not even touch; and in some particulars the discussers misquoted and misconstrued the reading of the paper itself, all with the view apparently, to destroy the force of my evidence which they seemed to fear would do harm to their established principles of practice.

Now I want it to be understood that I have no quarrel with these very good friends of mine who have always treated me with the greatest possible consideration, but I can now understand what Dr. Hawley meant when he has said to me on several occasions that the members of this society are very outspoken in the discussion of all papers; and I am pleased to find that this spirit has been so freely exercised on this occasion, because it gives me a chance to quite as freely express my thoughts in the same frank and friendly spirit in defence of the claims of the paper and much that was outside of the paper itself.

While I have always fully appreciated the wonders which the American Society of Orthodontists have accomplished in advancing the practice of orthodontia and its general employment, I have always believed, and now more especially after this discussion, that there is one unfortunate drawback which in my humble estimation seems to pervade this society and retard its development toward true scientific advancement, which is: that a number of its most influential members are so obsessed with the Angle radical teaching in regard to causes, extraction, and the normal occlusion formula, they cannot see that there is anything true outside of it, and I am especially surprised to find that they still swallow whole, Angle's fantastic creation teaching that all children when born are destined through inheritance to possess normal occlusions, which would always obtain, were it not for certain local causes, etc., etc. All of this I now emphatically assert, is contrary to the vital principles of biology which is taught in our schools, and regarded as one of the requirements of education. Judging from the arguments expressed by the discussers who tackled this part of the subject, it would seem that they do not think it of sufficient importance to even superficially inform themselves in regard to scientific principles and clinical evidence, which abundantly disproves the radical and absolutely silly assumptions.

The influence of these leaders is so strong and so arbitrarily kept before this society, its members hesitate to express opinions which they are plainly given to understand are contrary to the so-called basic principles of advanced orthodontia, but which they actually believe and practice; and moreover, what they have learned by experience they *must* practice if they arrive at results which they are beginning to appreciate and understand can only be fully accomplished in a rational practice of orthodontia. Even my friend, J. Lowe Young, who told me years ago that he believed that heredity was one of the principal causes of malocclusion, did not consider it politic—or something—to say one word in defence of heredity in his somewhat personal attack upon me and my advocacy of rational extraction which he must know is founded almost solely upon heredity as the cause of conditions which demand extraction.

This arbitrary imperialism of the leaders was shown in Dr. Hawley's remarks when he so scathingly condemns a man or men, who have the courage of their convictions to say, "they fear that orthodontia is more or less of a failure," after finding "that it is impossible to permanently retain a large proportion of their most important cases;"—probably the very kind of cases to which my paper referred, and which they had corrected by an extensive disto-mesial movement of the entire dentures to a normal occlusion. And he continued to

ring changes upon that very natural "failure" quotation of mine until he had twisted it into the assertion that I stated in my paper that "The modern practice of orthodontia as conducted by most men in the profession is a failure," and "The implication is that the whole practice of orthodontia, except along the lines he (Dr. Case) indicated, is a failure." That certainly is a very liberal friendly garbling of my paper, which practically, in itself, referred to only three distinctive characters of malocclusion. I may be wrong, but it seemed to me this endeavor to place me in the wrong light before the jury at the outset of his discussion was not so much because of my quotation as it was to vitiate the real claims of my paper in daring to propose a remedy before this society for the obviation of these failures which did not regard a normal occlusion of the teeth as so essential to the patient as the correction of facial deformities and permanency of retention, though it left the patient with an occlusion which was sufficient for all the necessary purposes of mastication.

The particular characters of malocclusion to which my paper was specifically confined were *inherited pronounced upper protrusions and lower retrusions of Class II, and upper retrusions of Class III*. In the correction of all these characters whenever in my early practice I attempted to shift the entire dentures to a normal occlusion in connection with *bodily* linguo-labial movements of the front teeth, it was impossible for me to permanently retain them, and because of this and its very great importance, I also was fast coming to the conclusion, in those days, that orthodontia was so much of a failure I would have gone back to the general practice of dentistry had I not discovered the remedy. And now when I place it before this society in an honest endeavor to help others, who like myself—keep it as sly as you choose—are fast coming to the same conclusion, I find that the consensus of opinion among these few leading members at least, is that all my principles of practice are wrong in regard to causes, diagnosis, treatment, and retention. And I cannot help but believe that this is because the remedy I proposed for these special failures is contrary to the arbitrary teachings of Angleism. (Please understand that I use the term Angleism in an adjective sense, and with no desire to cast opprobrium upon Dr. Angle himself.)

All this part of the discussion was, of course, presented in a very friendly manner, and aroused no feeling in me except to give me a few moments of good-natured amusement; especially when my friend Young asserted that I have done more harm to the cause of orthodontia by my advocacy of rational extraction, than I have ever done good. Well, perhaps there are times when the truth should not be told. But not when it pertains to the alleviation of wrongs to many people, among which may be mentioned the unfortunate practice of stamping for life upon the physiognomies of our confiding patients, noticeable facial imperfections and deformities which lie within the province of orthodontia to permanently correct.

The incident which he portrays of the dentist who wrongfully advocated extraction, is not an uncommon one, and with results at times that are exceedingly harmful. But is that legitimate evidence that under all circumstances in orthodontia no teeth should ever be extracted? If so, then the thousands of disasters which are constantly arising from ignorance or the inexcusable acts of fools should be regarded as evidence that we should desist from the employment of many of the greatest benefits of life.

Among the three characters of malocclusion to which my paper specifically referred, there was only one for which I advocated extraction of teeth. This referred to inherited upper protrusion with the lower denture in normal dento-facial relations, and with the lower buccal teeth in full distal malinterdigitation. In following the theme of my paper, I explained that one of the main reasons I extracted teeth in these cases was to avoid an extensive disto-mesial movement of the entire dentures required by a normal occlusion, and because I had found after many years of experience that such extensive movements of the entire dentures in inherited cases could not be permanently retained. Not but that there are other characters of pronounced protrusions for which I extract teeth, but this was the only character which I specifically mentioned that demanded extraction; and consequently, it was the only one that should have been discussed in relation to extraction. But what was the result? Before we got through, it seemed that almost the entire discussion pertained to the general question of extraction, even to extraction for impactions of third molars. And through it all, no one intelligently stated the particular malocclusion for which I advocated extraction.

Yes, Dr. Hawley it seems had a case of this kind in his early practice, which from the illustrations he threw upon the screen, appeared to be a bodily upper protrusion, which he presented to show the results that might be expected in following my method of treatment in these cases. If he had had an intelligent understanding of my method of treatment, which was fully published in all the leading dental journals at that time, he would have known that his case demanded a *bodily* retrusive movement of the upper front teeth after extracting the first premolars, and not the application of a single traction arch bow, which, of course, tipped the crowns back and the roots forward. I am wondering if he did not make about as much of a mechanical *faux pas* in the construction of that "half-dozen" retaining appliances which he says he made according to my methods, "that required no special skill." I do not in the least doubt they were failures in his hands, and I certainly wish him every success in the employment of that most primitive of all retainers, rubber plates. Though, judging from the many years of my employment of rubber plate retainers in my early practice, orthodontia certainly would be a failure to me if I had to rely upon that method of retention. But I have this to say in its favor: It certainly is much safer than those spurs and bars soldered to cemented bands resting on enamel surfaces that have been employed so extensively.

I wonder if it is possible that the kind of talk which Dr. Hawley gave in regard to my retaining system—of which he has practically no experience or intimate knowledge—could convince an appreciable number of intelligent members of this society who are acquainted with me and my work, that I would continue to employ this six-band retainer with auxiliary attachments, for every case I have regulated for twenty-five years, if it did not fulfill every requirement that can reasonably be expected of artificial retention? And I believe it will do the same in the hands of every orthodontist who is capable and willing to put into its construction *that exacting skill which it demands*, and who will see that it is properly taken care of during the time it is worn.

One would think from Dr. Hawley's remarks, that these retainers are left on the teeth without removal, and possibly without being seen during the entire time they are worn, and then at a stated period of two years they are removed without further thought, and as he says, "trusting to luck" as to whether or not the teeth retain their positions. All of this shows that he knows nothing about them from a practical sense. Whereas, the facts are that every patient is instructed how to keep them perfectly clean, especially above the interproximate clips, and then he is warned of the danger of not submitting them to an expert examination as often as once in two months to see that the forces of occlusion, etc., have not started the cement attachments, or that the cement is not being washed out, as it will at times even around the best of cast fillings. If this happens, the appliance must be immediately removed. This is easily accomplished with pliers especially constructed for that purpose. The appliance and teeth are cleaned, and all imperfections corrected before recementing.

It is true that patients at times through necessity or carelessness, do not regard these admonishments, and because of that, disasters arise. But is that not true at times in regard to the care of the teeth in general? Occasionally, but rarely, it will be found that this appliance which is necessarily frail and artistically delicate in construction, does not prevent the strong inherited reactive forces of the original irregularity from moving the teeth in phalanx, though perfectly within the grasp of the cemented bands, and with the appliance reinforced lingually with a No. 28 gauge clasp-metal plate. In one case recently, these same forces caused an original maltreated central incisor to break loose from its cement attachments and start to go back, though when attached it was perfectly within the grasp of its cemented band three-quarters of the way around the tooth. It simply required a little firmer attachment. Of course such an event could not possibly arise in Dr. Hawley's hands with a removable rubber plate resting loosely against the lingual and interproximate surfaces of this tooth. But just wait and see what will become of this method of retention in a few years when it has had time to be actually tried out.

I wish to say further that the six-band retainers usually remain on the teeth six months and longer without the necessity of removing them. In one case—that of my own daughter—the retainer remained without a single removal for two years, probably because of its special care, and since that time her teeth have never changed, or shown one ill effect from the retention. Dr. Harper, a noted dentist of Chicago, who cares for them, will vouch for this.

Dr. Hawley is right when he says that no one can tell when to stop artificial retention, except by trial. I have known of a number of cases whose malocclusions arose from heredity, which had been regulated with a view to permanency of retention by rational methods, but which started to revert to their former malpositions after being perfectly retained for two years, but which after being corrected and the same appliance or a new one worn for another six months or a year they never again changed. In these same cases had the entire dentures been shifted to a normal occlusion, nothing on earth could have produced permanency of retention. On the other hand, a large majority of cases in orthodontia arise from local causes and are therefore favorable for retention. *Even pronounced protrusions and retrusions arise occasionally from local causes.* Consequently, in all of these cases, or those which may have arisen in this way, among youthful patients especially, the retaining appliance, after it is worn six months or a year, is commonly left off for a few weeks' or months' trial, and if the teeth retain their positions it is not replaced.

In one case (that of the young woman who will type this manuscript) in which an upper protrusion was corrected after extracting a single premolar at the age of twenty years, the retaining appliance was worn less than six months. Since that time I have frequently shown her teeth to my patients as a type of a perfect occlusion.

Among the many criticisms of this system of retention that have been made *always* by men who have had no correct experience with it, the silliest is that it retains the teeth "*too rigidly in one position*," and therefore, it is against physiologic principles, and should not be employed. They do not always state exactly why, but leave it to the fertile imagination of others to juggle with. And so Dr. Hawley tells us that he "*does not believe* that many cases will stay after being retained with a rigid retainer such as this for two years," etc., etc.

Now let us briefly come right down to the truth of this question of the mechanico-physiologic demands of masticating root movements which has been quite extensively aired of late in papers and discussions upon the question of fixed and removable bridge dentures, and upon which I have expressed a somewhat lengthy opinion from a mechanical viewpoint and incidentally from physiologic and pathologic standpoints. This was read in connection with Dr. H. J. Goslee's paper before the Chicago Dental Society, and published in the September, 1919, *Journal of the National Dental Association*. In the biologic evolution of dentures, one of the functions of the pericemental membranes is to act as cushions in the sockets, to guard against injury or the devitalization of teeth, occasioned from sudden blows in the forces of mastication, etc. Consequently, because of this cushion quality, the teeth throughout untold generations have been caused to move slightly in their sockets under the forces of mastication, and therefore, this movement of the roots has in turn become a coordinating necessity to the health and vitality of the surrounding membranes.

It is claimed that many extensive fixed bridge dentures whose pier attachments are sufficiently strong to prevent them from breaking loose, hold the roots so rigidly in one position that their functional movements in mastication are prevented, and when this goes on for years, the functional activities of the pericemental membranes are impaired, followed by disease, death, etc. This, no doubt, is a true history of many extensive bridges when worn long enough, though it is not so true of small two pier bridges. That is my main objection to fixed bridge dentures which need not be discussed here from a mechanical standpoint.

Now consider for a moment the condition of the alveolar and membranous surroundings of the roots of teeth during and immediately after their orthodontic movements, often with their sockets passing through a profound state of physiologic repair and bone-growth, and compare that with the normal surroundings of vital and pulpless teeth that are employed for bridge dentures, and then ask yourselves if the two conditions come under the same category of argument. Remember also, that Nature's first act before the repair and union of fractures can take place, is to build a firm splint or bony callus to hold the parts immovably in relation to each other. Is it not, therefore, more in accord with physiologic demands to hold the roots of the teeth comparatively still during the processes of permanent repair of their sockets in the new positions, than to employ a removable retainer which every time it goes in and out may produce ten times as much movement to the roots of the loosened teeth as Nature performs in the physiologic movements of mastication? Besides this, the *cruz criticorum* of this whole attack upon the six-band retainer is that it really permits the

slight physiologic movements of mastication that are necessary for normal activities, because of the yielding quality of its delicate construction.

Were it not for this, the irresistible masticating movements of the teeth which have been known to split the pier roots of bridge dentures in two, would soon completely destroy any retaining appliance that held them rigidly in one relative position. That is really the secret of their stability of attachments. No, you will have to hunt for something stronger than this before you can destroy by words alone the twenty-five years of established utility of this appliance, which during the comparatively short time it is worn, if properly cared for, the teeth and gums are sure to remain in a perfectly healthy condition.

Before leaving the subject of extraction which was so extensively discussed, I wish to say that I have never advocated extraction as an aid to the correction of malocclusions, except in pronounced protrusive malpositions of entire dentures—the upper or the lower, or both dentures—in relation to the esthetic standard of dento-facial harmony *for the individual.*

There are certain things in regard to the correction of these cases *without extraction* that cannot be satisfactorily explained to any one who appreciates and values the possibility of a far greater correction of facial deformed outlines, and a far greater probability of permanency of retention *with extraction*, and who does not believe that the slight difference in mastication between normal occlusions and perfect malinterdigitating occlusions is a sufficient offset to these advantages.

Everyone who has given orthodontia any thought must see that upper dento-facial protrusions, in normal arch widths, with the lower denture and mandible in normal pose, cannot be corrected facially without extraction except by a retrusive movement of the entire upper denture *the full width of a premolar.* This is not to be thought of for many reasons, even if it is possible, and with difficulties greatly increased if the case demands a bodily lingual movement of the front teeth. On the other hand, if the treatment consists in a reciprocal disto-mesial movement of both dentures, with the intermaxillary force, you only half correct the upper protrusion and abnormally protrude the lower. In other words, you produce a partial bimaxillary protrusion. This has been freely pointed out in papers with illustrations from clinical results. But it requires no illustrations, as the statement of the fact is irrefragable. The same is true of lower protrusions with the upper normal. And in regard to the dento-facial correction of bimaxillary protrusions without extraction, one might as well attempt to lift himself with his bootstraps.

Now a few words in regard to heredity, of which I should like to say much, but the present length of my closing remarks will hardly permit. Since my interest and belief in the science of Evolution which began in the early 80's, when I attempted the writing of a weekly column entitled "Evolution" in the leading daily paper of my home town, upon which I received many personal compliments, among which may be mentioned several encouraging letters from no less a man than the late John Fiske, author of *Cosmic Philosophy*, etc., I have always kept in rather close touch with the advancement of biology as an established science, particularly in its branch of anthropology entitled somatology and ethnology. I speak of these things at this time to show that while I claim to have no more intimate knowledge of these subjects than may be ordinarily found among educated people, whatever statements I may make are not founded upon guesswork, or a mere superficial understanding, which too often leads men to express opinions in public they would never think of uttering were they more perfectly informed in regard to the work that has been going on in the world by original investigators and expounders of the truths of evolution and its branches.

I have long been impressed with the belief that one of the principal causes of malocclusion, and the one that has been the greatest stumbling block in diagnosis, treatment, and retention, of our cases in orthodontia, is heredity. Not the kind of heredity necessarily that is popularly in mind when this subject is broached, i. e.,—direct from parent to offspring—for heredity has a number of other branches through whose mysterious channels malocclusions amounting to decided facial deformities are quite as liable to obtain; among which may be mentioned the union of disharmonious types, direct and atavistic, which has been abundantly proved through the remarkable results obtained in the breeding processes by artificial selection, or hybridizing. Furthermore, there can be no doubt in my humble estimation that in countries whose inhabitants are composed of a vast variety of mixed types, as in America,

parental unions arise which fully respond to all the intricate demands of Mendel's law, which is one of the commonly demonstrated laws of heredity in cross-breeding.

If it is true—and as I believe every biologist will agree after giving a little thought to this branch of dentistry—that many of our most pronounced cases of malocclusion arise partly or wholly from heredity in some form, with its undoubted influence upon the advancing science of orthodontia, then we as practitioners and teachers of orthodontia should consider this subject worthy of the profoundest study. It is something which cannot be intelligibly explained in a few words, or even impressively referred to before men who have no foundation knowledge of the elementary principles and laws of biological evolution, any more than the higher branches of trigonometry can be taught to a class of students who only understand the elementary branches of mathematics.

With this in view, with the forthcoming edition of "Dental Orthopedics" I have devoted five chapters to the etiology of malocclusion, besides that which appears in diagnosis and practical treatment of classified irregularities, with the hope of giving to students at least a partial foundation for an intelligent understanding of the laws of heredity and natural variation, which play important parts in the production of malocclusion.

The oft-repeated, and so far as I know, only argument that is used to show that malocclusions cannot arise from heredity is the statement that "abnormalities are not inheritable." This may be briefly answered. But when uninformed persons assert that all children are born with all the physical qualities of perfect anatomical harmony, which they would not deviate from in development were it not for diverting local causes; or the statement made by Dr. Hawley, that when a child is seen to possess the same deforming character of malocclusion that is seen in the parents, that there is no scientific reason for believing that it arose from heredity, but rather that both parent and child were subjected to the same environing cause, or the statement that the moon is a green cheese, if you please, because it looks like it, one cannot effectively combat such statements without presenting lengthy scientific information founded upon well established facts, which is not admissible here.

I wonder if Dr. Hawley upon finding a child with a deformingly large nose would conclude with quite as much reason that it arose from a local cause? And then upon further investigation if he should find the same kind of relatively large nose upon the physiognomy of the father, would he still insist that evidently both parent and child had been subjected after birth to the same local cause, etc., etc.?

No one claims that "abnormalities," interpreted in a pathologic sense, producing at times deformities through perverted nutrition from disease generating bacteria, are inheritable, because every change in form from the primitive state which arises through heredity or natural variation must first be laid down during the metabolism of the fecundated germ cells, which is impossible with every form of microorganism producing disease. But what is important in this connection is: predispositions to these diseases are inheritable, with a far greater tendency toward their development, on the same principle that inherited immunity renders them less possible. All of this, however, has nothing whatever to do with the special phase of our subject, because the term "abnormalities," when rightly interpreted means simply physical anomalies, disharmonies, deformities, etc. And while some of them like cleft-palate arise through interruptions in development during the early stages of uterogestation, which may be caused by an inherited predisposition toward a lack of normal activity in the embryonic processes to normally unite, shown by several cleft-palate cases in one family or near relatives, and other deformities from traumatic injuries even before birth, still this does not change the rule that all physical disharmonies, natural variations, and anomalies, such as irregular teeth, etc., *are inheritable and pass through the same biologic processes as the normal*. Would you say that ears of deforming size in relation to the otherwise delicate features upon which they are placed have not arisen through some channel of heredity, but arose from a local cause? Or that a prognathous mandible whose protruding malposition has carried the lower denture far in front of a normally posed upper, resulting in a pronounced malocclusion, has arisen solely from some local cause, when such conditions are the well-established possibilities of cross-breeding? And so I might go on naming one proven fact after another that should thoroughly eradicate from the minds of sensible orthodontists that fantastic theory that all malocclusions arise from local causes.

I am often asked why it is that I consider it so important, from a practical standpoint, for orthodontists to believe that heredity and natural variation are among the main causes of dento-facial malocclusion. My answer is: First, because *it is true*—just as true as is the application of the laws of heredity everywhere. Second, because it opens a wide vista for correct diagnosis of many of the most important of our cases, and leads to a rational, effective, consistent, artistic, and permanent system of correction. Third, it eradicates the cut-and-dried rules along mechanical and mathematical lines founded upon an idealized “normal occlusion” as the basis of diagnosis and the one object to be attained at whatever cost.

June 24, 1920. Dr. Hawley has very kindly placed in my hands his revised discussion of my paper. I find it quite different in certain particulars from the stenographic report of his discussion made on the floor of the convention, to which my above closing of the discussion applies, but I feel that I can hardly be expected to cut out my answer to a number of his objections that were made before the society, and which was mailed to the publishers several weeks ago.

Besides a number of garbled quotations in his discussion of my paper, I find that there are two misleading statements in his present discussion, however, which I did not notice in his original one, that I must answer, and preface with the statement that if there is anything calculated to roil an author it is to have an opponent of his principles deliberately misquote him and then follow it with an argument built upon this false premise. He says: “Dr. Case recommends extracting ‘all inherited and even long acquired disto-mesial malinterdigitations of the masticating cusps.’” This is an absolute falsehood, deliberately put together to defame my teaching. He has gone far out of his way to find that particular combination of my words which he places in quotation marks, in order apparently to make it appear with his false addition that he has truthfully quoted me throughout, and that I really recommend extraction in all occlusions of that kind. And he takes that quotation right out of the middle of a sentence which has no reference to extraction, but on the contrary, to opening spaces for the insertion of artificial retaining teeth in the treatment of pronounced retrusions of the lower denture in relation to a normally posed mandible and upper denture; a division of Class II of which I have for years stated everywhere in my teaching *that extraction in these cases should be regarded as malpractice*. The whole of the sentence is as follows: “I was, however, coming to the conclusion which I hold today, that all inherited, and even long acquired disto-mesial malinterdigitations of the masticating cusps present conditions that should be disturbed with great caution, if at all, except to adjust the occlusion, and especially with no extensive distal movement of the buccal teeth, upper or lower, except in those cases in which the first permanent molars have drifted forward through the premature loss of deciduous teeth, or from other local causes.”

Upon the strength of his false statement that I *recommend extraction* in these cases, he goes on to illustrate cases in which he, Dr. Hawley, corrected them without extraction, just as I used to correct them by shifting the dentures to a normal occlusion, as shown in my Fig. 8, before I learned the danger of extensive disto-mesial movements of the buccal teeth.

The saddest thing to me in this regard is that he and others do not yet recognize the vast differences in character and demands of treatment in pronounced divisions of Class II, which are therefore treated, in the main, all alike under the head of “distal occlusions.”

In another place he says: “Dr. Case is *positive* in his statements that *only* those cases that are inherited he treats in that way, and he is *very positive* that he can tell an inherited case.” The above quotation which he himself made from my paper disproves this, and nowhere in my paper do I even intimate that I can always “tell an inherited case.” The facts are there are many cases which indicate heredity, and should be so regarded in the absence of the possibility of a local cause. But that is a big question which cannot be taken up here.

FAILURES OR UNSATISFACTORY CASES IN ORTHODONTIC PRACTICE*

BY DONALD S. STERRETT, D.D.S., ERIE, PA.

THE same human instinct which causes people to gather on the street when an accident has occurred, or scan the newspapers each day to find out what ill luck has befallen the various communities of their country, may serve to attract a number of people to attend this session to hear of the misfortunes that have come upon one of their number in his pursuance of orthodontic practice.

It is, however, so difficult to furnish with each case a complete enough history of complications and extenuating circumstances, so that a judgment can be rendered as to the reason for the failure and the party responsible, that that method has been abandoned, and instead, an effort will be directed to show the underlying causes of common failures, and individual cases will be used only to demonstrate a point.

The course of study offered by the Dewey School of Orthodontia, gives to its students, not only a fundamental and working knowledge of the best principles of orthodontics, but also a tremendous zeal and enthusiasm and confidence to go out among the people of their locality and practice the necessary reconstruction so evident on every hand.

To the comparatively large number of young men who have recently taken the course, and are eager for opportunities of expending this enthusiasm, I wish to particularly address my remarks, that their enthusiasm may be tempered by judgment, and their disappointments either be avoided or at least anticipated. And if in these remarks, I, who am also a young man in experience, commit myself in statements which the judgment of the older men find faulty, I trust that these statements may be corrected in the discussion, and that in that way the exposure of my opinions may be a benefit to some of us.

THE DIAGNOSIS OF THE CASE

Some time after opening my practice I find that I developed a tendency of giving rather optimistic estimates at the first examination of a patient, both as to the amount of work required and the expense involved. Some of the results of that tendency I still have with me, and some have been discontinued, mutually unsatisfactory.

From the studies of these case histories I formed the opinion that the time spent in assuring a parent that I could correct a malocclusion would have been better spent in cultivating the interest of the parents in the necessity and desirability of making an honest effort to correct the deformity, and establishing their viewpoint so that they would be willing to put into the case as much in atten-

*Read before the Alumni Society of the Dewey School of Orthodontia, Chicago, April 1-2-3, 1920.

tion to the child and financial assistance as I was giving in service and materials.

That would have obviated the unpleasant interviews in which the parent's main argument is that he understood that the case would be completed in first class shape by a certain time or upon the payment of a certain sum of money, irrespective of whether the patient had been sent away to school for nine months of the year, or had missed as many appointments as he had kept, or had developed tuberculosis or adenoids, or any other of the common causes of incomplete cases.

THE CAUSE OF THE MALOCCLUSION

The cause of malocclusion deserves a place of prominence in the examination and diagnosis, and emphasis placed upon the knowledge of whether the conditions which caused the malocclusion still exist or whether it will reoccur.

Demonstration of this point is found in the Class II case that starts off with encouraging progress shortly after adenoids have been removed and the nasal passages made fit for normal breathing. Then after a series of colds and infections that delay the work, the progress becomes very slow, and normal occlusion is established with great difficulty and the case retained a reasonable length of time. Shortly after the removal of retainers, a startling tendency toward the old malocclusion is noticed, and it will become more noticeable and discouraging until such time as the worried operator becomes suspicious of more adenoids or else some pernicious habit of lip biting or mouth breathing that disturbs the balance of the normal forces of occlusion.

A more remote cause of malocclusion was discovered in a case of rotated upper laterals in a patient of twelve years. The cause was assumed to be prolonged retention of deciduous teeth. The laterals were aligned and retained for a year. During treatment the right temporary canine had been lost and its successor was coming into place, the left temporary canine was still present when the retainer was removed. A year after the retainer was removed the left lateral was again rotated to its original position and x-ray search for further cause of malocclusion showed the left canine impacted against the root of the lateral in nearly horizontal position. The treatment then started consisted of surgically uncovering the crown of the impacted tooth, inserting a pin, and attaching with constant pressure to the arch. After the canine has been brought into proper position, the lateral will again be rotated with the hopes of a permanent result, but the second operation of this case was considerably more extensive than the first, and whether or not sufficient remuneration is received depends upon the attitude and viewpoint which was given to the parent in the early consultations of the case.

THE HEALTH OF THE PATIENT

Lack of attention to the general health of the patient can block the best laid mechanical plans and litter up a practice with unfinished cases that will drag along through a very long time.

One of my perpetual patients is a Class I case of an apparently normal girl starting treatment at the age of twelve. Two years was estimated as sufficient time for the active work, and the fee estimated accordingly, with no complications expected. The case has now been running for four years and still requires

the best part of a year of uninterrupted work to complete. She has already had over two hundred appointments, and has missed, in short periods, a little over a year on account of sickness and vacations. Frequent interruptions caused by illness and making necessary a repetition of work is more disastrous than several months lost on account of one illness followed by good recovery. An amusing incident in this case is the fact that the parent is withholding the sum of ten dollars deducted from his last payment, as a guarantee that I finish the case according to specifications. The inference is that I did not sufficiently impress that man with the fact that the completion of his daughter's work depended upon her health and building powers fully as much as on my skill and ability. Some will say perhaps, that any ordinary person should be able to figure that out for himself. Of course he should, but do not neglect to see that he has done so, or your faith in human nature will cost you a lot of money.

THE INTEREST OF THE PARENTS

The interest of the parents is essential, in getting a thorough history, keeping the patient's dental and physical health up to par, paying an adequate fee so that it will be a pleasure to work on the patient, and making payments promptly so as not to hamper the running of the office and practice.

Many cases would illustrate some feature of this point, but no more forcibly than did my own office records after my absence of twenty-one months in the army. The office was kept open from four to ten days a month by the best orthodontist it was possible to secure, and all patients had opportunity to be seen twice a month. On account of lack of interest, however, some children did not keep their appointments, some tampered with their appliances and lost considerable time, and many were very careless about their payments, thereby cooperating with me to the least possible degree in the necessities of this emergency arrangement, and showing as a result, little progress of cases during that time and barely enough money to keep the office open, even with the most careful management.

And now in conclusion I wish to state that there may be some who overcame these difficulties so long ago that they have almost forgotten them, and will think it stupid of me to take up their time in parading these elementary stumbling blocks, but the fact remains that I have been guilty of error on each of these points. If their exposition will save others from getting into difficulty, I am perfectly willing to be used as an example, and if it should show that I am the only one who is making these mistakes, I can still feel appreciative for being shown my abnormality.

DISCUSSION

Dr. Adelbert Fernald, Boston Mass.—I have been much interested in Dr. Sterrett's paper. There are many things that could be said in discussing a paper like this, as every man has his own method of conducting his business. There is a business side of orthodontia as well as a professional side. We can learn much from the successful business man. If the men here today would state frankly what rules and methods they have found successful in conducting their practices, we would all be benefited by it.

It seems to me, that if any man graduates from a professional school and immediately specializes in any branch (I don't care how much ability he has, or how conscientious he

is) he is going to be handicapped in many ways. Starting in any new line of business or profession there are many things to learn by experience. If a young man could be associated with an older and experienced one, or engage in general practice for a year or two, it seems to me that some of the problems which Dr. Sterrett speaks of could be avoided or made easier.

Some parents will ask how long a time it will take to complete the case, and how much it will cost, etc. To the first question, I will tell them frankly, I do not know, explaining the many causes which might delay the treatment, but that I must have all the time I need. The time used in explaining to the parent the benefits the patient will derive from early orthodontic treatment is well spent. We have in some cases to educate the parent or the patient why these things should be done. When a patient understands the amount involved, he can better understand why the fee should be in proportion to the time and materials used. If one will make models, x-rays, and obtain a full history of their cases, which one can show to the parent or patient, then, if it is necessary to discuss the financial side of the case, one can do so intelligently, as the patient can be shown at least to some extent, what has to be done and why.

Dr. Sterrett refers to the health of the patient. I think that is very important. If the health of the patient be much impaired, he could be referred to the family physician with any suggestions you may think helpful, such as having the adenoids removed, etc., and your treatment of the case deferred. But if the conditions were caused by unhealthy and irregular teeth, of course, the sooner your treatment begins, the better.

Dr. Lloyd S. Lourie, Chicago, Ill.—I certainly have had the same experience as the essayist has had and possibly some others, and I think a consideration of the difficulties to be encountered in our work is one of the most important things that has been neglected. We are apt to be very enthusiastic about the possibilities when we take our cases in orthodontia, and too often the difficulties to be encountered are minimized if they are mentioned at all. So I think any paper of this kind that will bring before the men who are beginning practice, the difficulties they are very likely to encounter is a fine thing. It is a fine thing for the orthodontist and the patient to consider together the difficulties to be overcome and that may be met with in the course of treatment as well as the advantages that may be gained. It is all very well to claim all the probable and possible advantages in orthodontic work, but many times it will come home to you if you overestimate the advantages to be obtained by the work.

Within the last month I had a young woman of thirty come to me; she was very unhappy, and it was a question whether she would ever recover from the results of a too optimistic explanation of the improvement that would accrue to her from orthodontic work. Whoever had done the work for this lady had obtained a good result but had made the mistake of promising too much. Her median line of the upper and the lower arches did not harmonize, and he was going to put these in alignment. She was unhappy because that was not accomplished. It did not amount to anything as effecting a satisfactory results in the case. He told her he would lengthen the upper teeth so that they would show when she smiled, and widening of the arch would fill out her cheeks and make her better looking and everything of that sort. He had not emphasized enough the value of the essentials in the case and he had emphasized a lot of nonessentials. She had better occlusion, and he had checked a progressive tendency toward a mesial occlusion condition. That patient, I am sure, will need quite a great deal of psychologic attention to get her back to normal, if this is ever accomplished I spent considerable time in the case, two or three days in succession, to correct the damage done that patient by a too optimistic prospect being held out to her.

I made the mistake in the beginning of my practice of being too optimistic, as a result of which I believed I could put most all teeth in normal occlusion, and it took several years to find out that I was on the wrong track. Dr. Hellman's paper is a very valuable contribution and will help us to estimate the difficulties we are encountering in treatment, if we adopt such findings as he has presented as a basis and modify them for the individual case.

The length of time it will take for treatment is so variable that we ought to be careful in our estimates; yet I think we should give the patient some idea as to the length of

time it is going to take and the difficulties to be encountered. You should not tell them that you cannot give them any idea of the expense. That is hardly fair; put yourself in the patient's position, and you want some estimate of the time it will take and the expense involved. If we will just adopt that rule, and try to take the patient's point of view, we may many times modify our original plans and findings. The chance to make a good fee should not prevent consideration of whether it would be an advantage to that patient to wait three months or six months or a year. If you were going to wear an appliance, would you want this or that form of appliance? And if you were in moderate circumstances, would you want to make payments in this way or that way. I believe a lot of difficulties can be overcome if we will only put ourselves in the position of the patient and make full explanations.

Dr. Sterrett (closing the discussion.)—Some two possible methods for solving difficulties we encounter were mentioned in the original paper. One would be that if we were enabled to get a fabricated brand which comprises the essential elements of each man's experience and inject that into each new orthodontist he would have the benefit of their experience with which to start out. That is the direct method, and does not seem to have elicited many volunteers. The indirect method which I have found to be efficient is attending these types of conventions and of mingling with thinking men in this branch and thinking men in business and in industrial branches. We meet with keen men of inquiring minds in these conventions, and almost on every occasion we will pick up some possible solution for one of the points harbored in one's mind and will have an opportunity to try it out, which is the fairest possible way, although he may not be able to put into successful practice more than one out of a dozen suggestions which other men might be willing to offer.

DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Under the Editorial Supervision of

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It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

A REPORT OF A CASE OF OTITIS OF THE MANDIBLE WITH AN EXTERNAL FISTULA CAUSED BY A SUPPURATIVE, PROLIFERATIVE PERICEMENTITIS OF A LOWER RIGHT THIRD MOLAR

BY M. N. FEDERSPIEL, D.D.S., M.D., F.A.C.S., MILWAUKEE, WISC.
Professor of Oral Surgery, Marquette University Dental School

MR. W. N., age fifty-nine years; occupation, janitor; weight, 150 pounds, reported at our clinic with the complaint that he had an external fistula of the lower jaw. (See Fig. 1.)

During the past year he had been suffering from a tooth that was sore on palpation, and about six months ago he noticed a swelling of the jaw which lasted from four to five weeks. The mass then became localized to the size of a walnut. On pressure it was found to be firm and immovable.

Two weeks previous to reporting to us, the swelling increased in size and there was considerable pain, which subsided after the pus broke through the skin.

The condition of his mouth as to cleanliness was fair, the mucous membrane normal, and there was no evidence of gingivitis. His physical condition appeared to be normal, the occlusion of the teeth was normal, and the pulps in the teeth were found to be vital. The x-ray showed a marked destruction of bone surrounding the roots of the lower right third molar. Upon passing a probe into the fistula tract, it would lead in the direction of the lower third molar.

We concluded that the patient was suffering from a suppurative, proliferative pericementitis of the third molar, and that the pus had burrowed through the bone and made its appearance on the outside of the jaw.

The patient was operated on under ether anesthesia. After making an external incision, there was found to be considerable bone destruction in the

fistula tract, which led up to the third molar. The tooth involved was then removed, and surrounding the root ends was found to be a large mass of chronic inflammatory tissue. The entire area was thoroughly curetted, and then packed with iodoform gauze which was left to protrude externally.

The patient was then put to bed, and forty-eight hours later the gauze was removed. The wound now appeared healthy and granulating. It was re-



Fig. 1.

packed, and twenty-four hours later the packing was again removed. It was now left open, and six days later the patient was discharged, having fully recovered.

This case is interesting because of the marked destruction of bone with an external fistula, caused by a suppurative, proliferative pericementitis, without any external manifestation of a gingivitis.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Plastic and Cosmetic Surgery of the face. A. G. Bettman. Northwest Medicine, 1920, xix, No. 8, p. 205.

Plastic surgery of the face includes all of its parts; nose, mouth, ears, eyelids, neck, chin and cheeks; plastic work about the nose being probably the most common. Over sixty different operations have been described for the restoration of the nose. Another domain of plastic surgery is the removal of wrinkles of the face and neck, double chins and such like deformities. The location of the incisions in these cases must be given careful study, as their location varies with each case, and strict aseptic technic is essential for good results. A number of cases were successfully operated upon by the author, including the plastic correction of a very marked nasal deformity in a young woman of 24 years, who is said to be now "very proud of her nose."

By means of plastic and cosmetic surgery of the face the following results among others may be obtained. The nose can be made larger or smaller or changed in type; the size of the mouth may also be changed; deformities of the ears are made to disappear; a weak chin can be built out, and hollow cheeks made plump; wrinkles also yield to the touch of the surgeon; ectropion and other deformities about the eye may be corrected. Caution is indicated not only in the performance of the various operations, but also in the promising of results. The scarring which results from cutting operations, although it is as a rule very slight and unnoticeable when the work is carefully done, must be explained to the patient. Hopeless conditions should be let alone, and deformities caused by disease should not be operated on while the disease is active. The injection of paraffin and allied substances for the correction of defects of the nose and about the forehead is not to be recommended.

Epithelioma of the Mouth in a Young Person. P. N. Grant. British Medical Journal, Dec. 13, 1919, ii, p. 775.

The author's observation concerned a lad not out of his teens, aged 17 years and 11 months, who came under treatment for a swelling of the face which he believed to be a gumboil. When working at his trade as an up-

holsterer, he had been in the habit of putting tacks and threads in his mouth, these irritants probably acting as the exciting cause of the disease. The patient's teeth became so loose that he was able to remove with his fingers the left upper second bicuspid tooth and soon afterwards two molars on the same side. The Wassermann reaction was negative. A growth of typical epitheliomatous character was found to involve the left half of the palate with an extension to the right of the middle line. The alveolar margin from the upper second bicuspid on the left side backwards was broken down, and a probe passed into the maxillary antrum gave the sensation of having entered a rather soft mass which bled freely. Two pieces of the growth were removed for microscopic examination, and the specimen was found to consist almost entirely of squamous epithelioma of somewhat active-looking type. Treatment consisted in excision of the left upper jaw, the diseased structures being removed as thoroughly as possible up to and including part of the floor of the orbit. The anterior ethmoidal cells, being involved, were charred out. Subsequently, radium was repeatedly applied in the nostril and externally below the left orbit. The patient made a good recovery from the operation, and for some months his condition was improved, but symptoms developed gradually which indicated extension of the disease to the cerebral centers, and he died about a year later.

A Case of Adamantinoma of the Upper Jaw. F. Weichselbaumer. Wiener Klinische Wochenschrift, 1919, No. 35, p. 881.

Tumors known as adamantinomas, on account of their origin from a special embryonic tissue, the enamel organ, rank nearly first in order of rarity among the tumors of the jaws. The author's observation concerned a man of twenty-nine years who had been operated upon at the age of ten years for a tumor of the right upper jaw; this tumor was said to have developed as a sequel of a tooth-extraction and required about three years for its development; it was situated in the region of the molar teeth and concerned not only the bone, but also the gingiva. At the time, this painless tumor was interpreted as a fibroma and was removed as radically as possible through partial resection of the right maxilla. Upon the basis of the histologic examination, the diagnosis of cylindroma was rendered. Seventeen years later, the patient again observed the development of a thick, hard tumor in the same jaw, which caused no special disturbances. When the patient came under observation, the new tumor was seen to bulge out the region below the infraorbital margin, and to present a nodular surface. The only teeth left in this half of the jaw were the canine tooth and the two incisors. This tumor was removed under ether anesthesia and on the basis of the microscopical findings was pronounced to be an adamantinoma. The patient was discharged ten days later, with a well-healed wound, and free from disturbances.

Concerning the time of the occurrence of these tumors, they may appear from the first to about the fourth or fifth year. In view of the fact that they grow very slowly at first, causing practically no disturbances, their first origin may presumably be referred to the time of puberty, or perhaps still earlier, to the period of dentition. The female sex is said to be somewhat more fre-

quently attacked than the male. The seat of predilection of these tumors is the lower jaw; they are very rarely encountered in the upper jaw. The region of the wisdom teeth is most likely to be affected. Tumors of the upper jaw show a greater tendency to recurrence, but probably only because the superior maxilla cannot be as radically operated upon as the mandible. The diagnosis is usually rather difficult. New growths of this kind are often interpreted as fibromas, osteomas, or even infectious granulomas, especially when the buccal mucosa is also involved and changed through secondary infection. In the majority of the cases, the exact diagnosis is possible only on the basis of the microscopical examination. It has been suggested that the nodular character of the adamantinomas in x-ray pictures may perhaps be utilized in the rendering of the diagnosis.

The Treatment of Parotid Fistula by Resection of the Auriculo-Temporal Nerve. H. de Stella. *Le Scalpel*, 1920, March 6th.

In a case of parotid fistula following an operation on suppurating and caseous glands in the parotid regions, the auriculo-temporal nerve was resected by the author, after other methods had failed. The salivary secretion was decidedly diminished on the second day following the operation, and the fistula was closed about four weeks later. The success of the operation in such cases is to be explained as follows: The auriculo-temporal nerve supplies the parotid gland with secretory fibers from the otic ganglion, to which they have been brought by the glossopharyngeal nerve by way of Jacobson's nerve and the lesser superficial petrosal. Resection of the nerve causes an arrest of the salivary secretion for a period sufficiently long to permit cicatrization of the fistula.

Radium and X-ray Treatment of Laryngeal Carcinoma. G. Alexander. *Wiener Klinische Wochenschrift*, 1920, xxxiii, p. 12.

The patient was a man 62 years of age, with epithelioma of the larynx which had invaded the pharynx. Surgical interference was not accepted, and radium combined with x-ray treatment was accordingly instituted, with favorable results, in so far as thirteen months later there was no evidence of metastases, ulceration, infiltration, or cachexia. Although the tumor had not diminished, but actually slightly increased, in size, the new growth judging from the findings on biopsy was made up only of connective-tissue. At the time of the patient's presentation at the Vienna Laryngological Society, his general condition was very good, and all symptoms referable to the growth had subsided, apart from occasional slight local pain and difficulty in swallowing.

Diagnosis of Paradental Cysts of the Upper Jaw. J. Jacques. *La Presse Medicale*, 1919, xxvii, p. 696.

The designation of paradental cysts is applied to unilocular fluid tumors with serous contents which develop in the substance of the upper jaw, in connection with the root of a carious tooth, and containing no constituents of

the crown. The exclusive localization in the superior maxilla is an important distinguishing feature of these growths. Paradental cysts may appear under two forms, closed and open. The former, when it has reached the surgical state of its development, gives rise to a maxillary deformity involving one or other of the walls, and more or less accessible to exploration according to its location. In the external germs, the resulting protuberance of the cheek or lip is very striking. The affection most nearly resembling closed paradental cyst, in its outer symptomatology as well as in its mode of development, is mucocele of the antrum of Highmore, which likewise deforms without perforating the external table of the maxilla in its different portions. A possibly less rare affection than mucocele, which leads to deformities comparable to those produced by fluid tumors, is sarcoma, a disease showing a certain predilection for the region of the ascending ramus, and sometimes simulating a cyst derived from the lateral incisor or the eye-tooth. The intactness of all the corresponding teeth (paradental cysts developing only on carious teeth), adhesion and early vascularization of the integument, the changed consistence, relative transparence on radioscopy, etc., are usually quite sufficient for the distinction of malignant tumors from benign neoplasms of cystic character. The same considerations would serve as discard or retain the assumption of a primary epithelial cancer of the antrum of Highmore. Osteoma of the maxillary sinus is exceptionally hard on palpation and opaque to radioscopy. The differentiation of paradental cysts from inflammatory swellings of the maxilla sometimes meets with difficulties. Destruction of the wall of a closed paradental cyst opens an avenue of entrance to pyogenic buccal bacteria and results in the formation of a maxillary fistula. This may be permanent or intermittent, according to the degree of virulence of the pathogenic germs and the power of resistance of the tissues. The products of the fistula may be prevalent, or actually offensive, or the secretion may be of serous character, still preserving some of the original features of the cystic gathering. The fistula is always situated in the mouth, usually on the floor of an alveolus, often also in the external gums, much more rarely on the palate. Open paradental cysts with fistula formation may be confused with either sinus inflammation, or with an ordinary chronic dental abscess. However, with an adequate understanding of the anatomo-pathology of paradental cysts, the correct diagnosis does not as a rule prove difficult, and it is often sufficient merely to keep these formations in mind to recognize them in a given case.

Statistics of Lingual Carcinoma. W. Peters. *Deutsche Zeitschrift für Chirurgie*, 1920, cliv, p. 298.

Among the various localizations of carcinoma, a prominent place is occupied by cancer of the tongue, on account of its extremely rapid course. The more carefully the syphilitic and tuberculous ulcerations are distinguished from the cancerous cases, the more striking is the brief duration of this disease, preceding the initial stage which is almost devoid of symptoms, and the fatal outcome. Notwithstanding the most scrupulous aseptic precautions and improved technic, the permanent results of operations upon lingual cancers still remain more or less unsatisfactory. In the clinics of Garré, in Bonn, as

shown by investigations extending over the last ten years, the survival of patients beyond two years amounted to 15 to 20 per cent. Operations followed by x-ray treatment is nevertheless indicated in all those cases where there is a reasonable expectation of radical removal of the tumor; for although a permanent cure is not to be anticipated, a prolongation of life by several months can be expected on the basis of the results. The average survival of nonoperated patients has been estimated at twelve months, whereas, surgical interference is frequently followed by survival of two years. The deep cervical glands require removal at the same time, operation without extensive glandular removal being incomplete, also when an involvement of the glands is not clinically demonstrable. Technically, the best survey of the field of operation is provided by incisions of the cheek and temporary resection of the jaw.

Remote Manifestations of Focal Dental Infections, with Case Reports. R. Fernandez. *The Philippine Journal of Science*, 1920, xvi, No. 1, p. 89.

The author emphasizes the fact that hardly any importance has been given to alveolar abscesses as possible causes of serious and remote disorders in the body. The two main dental infections that commonly bear relation to certain forms of arthritis, neuritis, neuralgia, various types of rheumatic manifestations, and certain pathologic conditions in the stomach, the duodenum, the appendix, the gall-bladder, the heart, and the kidneys, as well as blood diseases, such as pernicious anemia, are the apical and periapical abscess and pyorrhea alveolaris. The manifestation of chronic dental infection cannot generally be diagnosed with accuracy by any clinical means without the x-rays, and even with them in certain cases with difficulty. The extra oral method with photographic plates is employed by the author as a routine in dental radiograms, in the Philippine General Hospital; by these means can be obtained not only a large number of teeth, but certain information concerning both maxillæ, especially the upper, in its relation with the nasal cavities and the maxillary sinuses. All the teeth and the maxillæ could be successfully explored with the oblique projection technic, thus detecting any change from the normal appearance of each particular tooth. In the interpretation of the x-ray plates, for the detection of apical abscess, the relation of the natural cavities must be kept in mind, so as to guard against mistaking one of the natural cavities for a shadow produced by an abscess. With the foregoing precaution, it is relatively easy to recognize any abscess developing in or around the dental apex, also in the absence of clinical symptoms, if the negative shows a dark area circumscribed in the dental apex or in the alveolar cavity, and if this dark area is well defined and sharply separated from the neighboring tissues by a line of demarcation. This dark area, a very characteristic radiogram of an abscess, is produced by diminution of density, or decalcification and sometimes destruction of dental tissue. The probable presence of pus in the alveolar cavity is suggested by a very dark, almost black, area.

In ten cases of articular rheumatic, and neuralgic pain, in adult American, European, and Filipino patients, a thorough treatment of the teeth by

the dentist, with extraction if necessary, sufficed to eradicate all symptoms and other disturbances. In instances where a conjoined local treatment by the dentist, and the use of vaccines by the physician, were available, improvement was more rapid, especially when autovaccines were employed. As the symptoms subsided with the disappearance of the focus of infection, the symptomatic manifestations were evidently related to the dental infections. In cases where cultures were made, *Streptococcus viridans*, associated with *Staphylococcus* was obtained in one case; in the other, only *Streptococcus viridans* was found. Vaccine of 100,000,000 per cubic centimeter was prepared from the microorganisms obtained from each patient. Gradual recovery was noted in patients treated by the cure of affected teeth, or by simple extraction, while those who received local treatment associated with vaccine therapy recovered more rapidly.

Malignancies of the Mouth and Neck. E. H. Skinner. *Nebraska State Medical Journal*, 1920, v, No. 7, p. 194.

Based upon prolonged experience with radium and x-ray, the author points out that there are certain lesions where radiotherapy is absolutely demanded. Radium, according to his experience, is a specific treatment for leucoplakia, the ease with which radium can be applied upon dental-rubber-impression compound to any and all parts of the mouth brings the disease quickly under control. In epulis, the postoperative use of radium is the best insurance against the recurrence of these near-sarcomas of the alveolar portions of the superior and inferior maxillæ. Very small and early lesions may be taken care of by radiation alone. Osteosarcomas of the maxillæ and antrum of Highmore lend themselves to a combination of surgery and radiotherapy. In cancer of the tongue, the use of radium and x-ray furnishes some desirable temporizing features in hopelessly inoperable cases. Early stages of ulceration of the lingual mucosa can be managed with radium to the lesion and through x-ray blocking to the lymphatics of the neck. Every radiotherapist can show results in carcinoma of the lip, and in the various stages. It is worth writing that in malignancies the denser the lesion the more promptly does it respond to radiotherapy. Radium is more reliable than the x-ray in the orifices, sinuses, and upon all mucous membranes. Without sufficient filtration radium gives immediate superficial effects; with filtration and distance, the deeper effects are achieved. Its radius of activity rarely exceeds 2 cm., and unless large amounts are available with heavy filtration, it does not complete with deep Roentgen therapy for cross-fire irradiation through healthy tissues to a deep malignancy.

Bilateral Syphilitic Parotitis with Left-sided Facial Paralysis. A. Lemierre. *Bulletins et Memoires de La Société Médicale Des Hôpitaux de Paris*, 1919, xliii, p. 510.

Syphilis of the salivary glands is a rare affection, and the author accordingly wishes to report a case of bilateral syphilitic parotitis complicated by left-sided facial paralysis, in a soldier 22 years of age. The condition was at first interpreted as a parotid tumor, but improved rapidly under the influence

of specific treatment. The disease developed in the absence of general phenomena and without pain. At the end of a month, both parotid glands had become very voluminous, of wood-like hardness, and left-sided facial paralysis of the peripheral type was present. A cure was very readily obtained under the action of potassium iodide. Although the Wassermann reaction could not be tested and no trace of syphilis could be discovered in the personal and family history of the patient, or in the findings on physical examination, there would seem to be no doubt as to the specific character of the parotitis. The peculiar hardness of the swellings, their indolent character, their development without general and local reactions, finally the favorable and rapid effect of iodine treatment, are all conclusive arguments in favor of syphilis. The outset of facial paralysis as a complication of voluminous swelling with induration of the parotid is sometimes suggestive of the existence of a malignant tumor of this gland, but in the author's case this diagnosis was rejected on account of the bilateral character of the lesion. Parotid syphiloma may be unilateral, as in a case observed by Morestin. A certain number of instances of tertiary syphilis of the salivary glands have been reported by surgeons who considered it advisable to institute tentative antisypilitic treatment before proceeding to the removal of the tumor. The value of this measure is illustrated by the author's personal observation.

Chronic Paroxysmal Trigeminal Neuralgia and Its Treatment. W. Harris.
British Medical Journal, 1920, i, p. 693.

In taking the histories of cases, the author was impressed by the number in which the pain had definitely started immediately after dental operations or antral abscess. No other nerve in the body, except the second and third divisions of the fifth nerve, is so liable to chronic infection of its branches, and although in some cases even many years have elapsed between the loss of a tooth and the onset of the neuralgia, yet this does not exclude septic neuritis from dental infection as the cause, and when the infection has thus spread backwards into the dental filaments within the jaw it is easily understandable that removal of the tooth does not cure the neuralgia; indeed, it often makes it worse. Dental operations, fracture of teeth, difficult stump extractions give rise to the pain in a certain number of cases. A blow upon the jaw or face may also become the cause of onset of chronic paroxysmal trigeminal neuralgia. This occurred in six of the author's cases. The pain may at first be mistaken for dental neuralgia, but the spasms gradually increase in severity, in spite of the removal of teeth, until at last it is realized that the neuralgia is of the graver inveterate type. Bilateral trigeminal neuralgia is comparatively rare, but twenty-five bilateral cases came under the author's observation and treatment. In the very large majority of unilateral cases, the right side is affected in correspondingly greater frequency, namely in 62 per cent as compared to 38 per cent, in the author's material. He does not know whether any statistics are available of the relative frequency of dental caries on the two sides. Other factors, too, have to be taken into account which may act as the exciting cause for the origin of trigeminal neuralgia.

Regarding treatment, practically the only two methods are gasserectomy and alcohol injection. In the author's opinion, the former operation should never be undertaken until alcohol injection has been thoroughly tried. During the last ten years he has injected the Gasserian ganglion with alcohol through the foramen ovale in 63 cases; in 31 the anesthesia has remained total and no recurrence of pain has taken place. In many of the remainder partial ganglion anesthesia has persisted, though pressure could be felt, yet the relief from pain appears to be equally good. In almost every case as soon as anesthesia develops from the injection (about 1 c.c. of 90 per cent alcohol) the neuralgic spasms cease, and they can no longer be started by any chewing movements, or rubbing the face. The duration of the cure rarely lasts less than twelve months, if good anesthesia has been obtained, and in the majority the relief from pain lasts from two to three years.

Extrinsic Tumor of the Larynx, Cured by Radiotherapy. Trétrop. *Revue Laringologie d'otologie et de Rhinologie*, 1920, No. 12, p. 378.

The author reports an observation on a woman 67 years of age, suffering from an extrinsic tumor of the larynx which prevented swallowing, and which was cured in a period of three months, by means of local treatment and deep x-ray applications. The cure dates back to October, 1919. The probable diagnosis was extrinsic malignant tumor of the larynx. The advisability of resorting to x-ray treatment before proceeding to extirpation is emphasized by the author. He raises the question of this mode of treatment which has proved so useful in uterine fibromas, should not be extended to the field of nasopharyngeal fibromas.

Streptococcus Viridans Infections of the Mouth and Throat with Reference to Neuritis and Arthritis. C. H. Hay. *Ohio State Medical Journal*, 1920, xvi, No. 3, p. 162.

Attention is called by the author to the importance of a thorough search for the focus of infection in the buccal cavity of patients presenting themselves complaining of neuritis, and cases of arthritis which are not accompanied with swelling and fever. It is probably safe to say that lumbago, neuritis, arthritis (without swelling and fever), are merely symptoms of systemic invasion of the chemical toxins produced by a focus of infection, usually the *Streptococcus viridans* germ. The infection is located at the apex of a tooth, or around a tooth where there is pyorrhea, or in the tonsil crypts, most frequently in the order named. A tooth can have an active apical infection, causing the most painful neuritis of any or all the nerves outside the brain and cord, while the patient may have no discomfort from that tooth, and there need be no discoloration of the gums. As the *Streptococcus viridans* germ does not produce gas or pus, there is no pressure at the apex and the tooth is not painful. Mere inspection of the teeth and tonsils is not enough for the discovery of an existing infection, but it is necessary to prepare an x-ray picture of the teeth and to make a culture from the tonsil crypts. Bridges, crowns, pivot teeth, and all large fillings should be x-rayed. If a thorough search reveals no focus of infec-

tion in patients who have previously had all their teeth extracted, the gums should be x-rayed for infected roots which might have been left behind at the time of extraction, and a focus is frequently found there. With the author it is routine to have the teeth x-rayed, a culture taken, and a vaccine made for all infections of patients suffering from neuritis and arthritis. In his experience with over five hundred patients, vaccine treatment was found eminently satisfactory.

Meat Diet in Sprue. T. Conran. *British Medical Journal*, 1920, ii, 206.

Two observations are reported by the author in support of the value of a pure meat diet, even in the most advanced and chronic stages of sprue. The patients were women of 47 and 38 years, respectively, in whom a milk diet had previously failed to cure the disease. The extreme initial emaciation and exhaustion of these two patients, together with their steady progress and complete recovery, under a pure meat diet, are features emphasized by the author. A circumstance worthy of note is the occurrence in the course of each case of tetany, which subsided with the introduction of an exclusive meat diet. The condition in both patients was of protracted standing. In both cases, the premature addition of carbohydrates other than those in fruit, was followed by relapse. The second patient had had pyorrhea alveolaris, and carious teeth, had been extracted, so that the lower teeth were deficient. At the time of admission, examination showed the mucous membrane of the tongue and mouth to be red and sore, with a number of irregular ulcers. The condition of the mouth gradually became normal under appropriate meat diet, which should be instituted as soon as the diagnosis of sprue is made.

The Diagnosis of Dental Neuralgias. H. Kron. *Deutsche Medizinische Wochenschrift*, 1920, No. 19, p. 516.

Diseased teeth are not infrequently the cause of trigeminal neuralgia, but it is not always easy to decide whether or not the teeth are responsible in a given case. The pain is not necessarily felt in the teeth themselves, or the wrong teeth may be accused by the patient. Psychogenic facial pains may prove very misleading, especially when the teeth are not unobjectionable, as is usually the case. Aside from certain exceptions, where a dental origin is excluded, an examination of the teeth and jaws should be carried out in all cases of trigeminal neuralgia. However, the ordinary methods do not always reveal the source of the trouble, and Roentgen examination fails in the most common cause of neuralgia, namely in the demonstration of pulpitis. Faradization of the teeth is a valuable method, but not yet in general use; moreover, the procedure required skill and experience, and is not applicable in the presence of deeply adjusted metal crowns.

The author was enabled to show that certain reflex relations exist between the teeth and other areas of the trigeminus, as well as the occipital nerves and still more remote districts. Neuralgic earache, often combined with a pain in the temple, which more rarely occurs alone, should always attract attention to the two anterior lower molars, especially the second, when ear-disease can be excluded. The reflex here takes place in the terminal distribution of the auri-

culo-temporal nerve. Temporal pain alone was occasionally observed in diseased conditions of the upper wisdom teeth. Pain in the throat or below the submaxillary angle is encountered in disturbances of the lower wisdom teeth, and corresponds approximately to the maximal point of the upper laryngeal zone of the head.

In contradistinction to psychogenic pains, which are less severe than other dental pains, reflex pains are of a distinctly neuralgic type, although the intervals between the attacks are shorter than in genuine trigeminal neuralgia and may be altogether absent. Both forms are characterized by their definite distribution and uniform manifestation. Long continued dental neuralgia, however, does not remain restricted to its original boundaries, but radiates into other nerve-territories. The grave forms of genuine trigeminal neuralgia, in which the patients anxiously endeavor to avoid all movements of the face, also chewing, are never referable to the teeth. Nevertheless, there are certain cases difficult of interpretation, it is noteworthy in this respect, that genuine trigeminal neuralgias are extremely rare in youthful individuals and hardly ever occur in children. A dental origin of the pain is suggested by this onset, or aggravation, respectively, when the patient lies down. In looking for the source of a neuralgia felt in the teeth, it is necessary to keep in mind also the excentric, menstrual, toxic, malarial, and diabetic neuralgias. The latter have a predilection for the third branch and are apt to be bilateral.

The Administration of Anesthetics. Editorial. *The Medical Journal of Australia*, 1920, p. 599.

At the Congress of the Dental Association of New South Wales, recently held in Sydney, the use of ethyl-chloride as a general anesthetic for dental operations was recommended, and in this connection the question has been raised, whether a dentist without medical qualifications should be allowed to administer a drug for the purpose of inducing a state of unconsciousness during an operation. In the interest of the patient's safety, the public should be warned against the practice of allowing dentists to administer a general anesthetic. As long as the law does not forbid unqualified practice, dentists cannot be prevented from taking this considerable risk. The matter is one between the public and the dentist. If the public understood these things and recognized that these rules are necessary for its protection, the practice of the administration of general anesthetics by dentists would soon become limited. In the majority of cases, the dentist would resort to local anesthesia, to the advantage of his patient and to enhancement of his own reputation. When local anesthesia is employed, the dentist accepts the responsibility for the consequences of the drug injected. The public is satisfied to trust the dentist to carry out the injection of the local anesthetic, and the patients would probably not be safer in the hands of a medical practitioner, especially when the latter has not the same manipulative dexterity in dental operations as an experienced dentist.

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EDITORIALS

Some Evils of Commercial Affiliations

ATTENTION has often been called to the fact that the dental profession has been placed in an embarrassing position as a result of close relation with commercial enterprises. The profession as a whole has suffered from the acts of a few with commercial ideas in more ways than one. We have heard the statement that dental science was developed by the commercial men—the dental dealers and the manufacturers. In the face of this statement, we wonder what was responsible for these various trade houses! It is true that many things have been made easier for the dentist by the manufacturer, but that, in our opinion, does not give the manufacturer the privilege of dictating to the dentist what he shall do or what he shall use.

It was only a short while ago that all of the dental journals published in America were controlled by commercial houses; but we are glad to see the

developing tendency of the dental profession to give its support to scientific journals conducted for the benefit of the profession, and not for the advancement of some manufactured article. Dental dealers are necessary; but they should not be permitted to control the dental literature or the dental conventions.

Within the dental profession is found a class of men who are a greater handicap to scientific advancement than is the dental supply house. We refer to the professional man who occupies an enviable position among his fellow practitioners and who is controlled or influenced by commercial relations with some manufacturer or dealer. We have many times seen men very enthusiastically advocate some particular style of treatment or the use of some device in which the output of the drug or appliance required is practically controlled by a commercial house in which the dentist has a financial interest. In some cases these men may be honest in the belief that they are advocating the best known; however, their arguments would sound better if they were not commercially interested. It is very difficult for some men to see anything wrong in an instrument or technic when it contributes to their financial income.

Only recently we had an opportunity of listening to the deliberations of a committee from one of the scientific dental societies. The committee was trying to arrive at some definite conclusion regarding a technical question. On the committee were a few men who were interested in the problem from a purely scientific standpoint and some who may have been interested from a scientific standpoint but who also had decided commercial affiliations. The men who were interested in the report of the committee from a commercial standpoint had much more to say than any one else. They were also determined to block the progress of the committee unless the report gave the commercial advantage to their articles. Three commercial organizations were represented, and each was determined that its side should have a little the best of the committee work. As the work progressed, it became evident that any report suggested not particularly favoring the commercial interests of those present would have a hard time getting before the society. This condition was deplorable because these men occupied high positions in the profession but seemed utterly incapable of setting aside their financial interests for the good of the profession. In spite of the fact that there were so many men who had interests other than scientific, it was with pleasure that we observed some who were interested only in the scientific solution of the problem, and in the end the commercial ideas will be swept away.

Orthodontia has suffered for a number of years from the taint of commercial interests in the sale and advocacy of certain appliances. Unfortunately, many regulating appliances have been patented, manufactured, and pushed by men in the profession as well as by the dental dealers. At the national meeting in Boston, regulating appliances were exhibited and claims made for them that could not be carried out by the average man. Certain appliances are advocated in so-called scientific articles and journals. These are not scientific articles, but mere advertisements re-dressed and placed in the scientific section of the journal. It is the policy of some commercially con-

trolled journals to see that an article is published at frequent intervals by some prominent man in the profession describing some of the appliances manufactured or sold by the house publishing the journal, even though there be nothing new in the appliance or the printed matter.

These commercially inclined individuals are not content to get into print, but often present papers before scientific societies. Recently, influence was brought to bear upon a program committee of a state society by a commercial house, with the result that the committee, unknowingly, invited a man prominent in the profession to read a paper. It developed that the essayist was on the payroll of the commercial house, and the paper was given over to describing a product that the commercial house contemplated putting on the market. Here the society became an ethical advertising medium for the manufacturer's product.

Commercial houses are necessary, but they should be kept in their place; and their place is not the most prominent part of a dental convention, a society program, or a scientific dental journal. The dentist who has commercial ideals should change his calling and become a commercial salesman and not a professional man. Above all, the dental profession must not let commercial men or houses decide the question of professional procedure for them.

ORTHODONTIC NEWS AND NOTES

The editors desire to make this department a permanent feature of the Journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

Annual Meeting of the American Institute of Dental Teachers

The next annual meeting of the American Institute of Dental Teachers will be held at the Claypool Hotel, Indianapolis, Ind., January 24th, 25th and 26th, 1921.

The program will contain much of interest in dental teaching methods and dental educational affairs. A cordial invitation is extended to all ethical practitioners and others interested along these lines to attend the sessions.

DR. ARTHUR D. BLACK, President.

DR. ABRAM HOFFMAN, Secretary,

381 Linwood Ave., Buffalo, N. Y.

The Eastern Association of Graduates of the Angle School of Orthodontia

A regular meeting of the Eastern Association of Graduates of the Angle School of Orthodontia will be held on Monday, November 29th, at the William Penn Hotel, 6th Avenue, Penn Street and Oliver Avenue, Pittsburgh, Pa. The following interesting program has been arranged:

10:00 *A.M. Paper.*

"A Consideration of Impactions," by Dr. Rea Proctor McGee, Pittsburgh, Pa.

11:00 *A.M. Paper.*

"The Results of Recent Experiments with Plants and Animals" (Illustrated by lantern slides and live rabbits from experiments of the speaker), by Prof. H. D. Fish, Department of Zoology, University of Pittsburgh, and Research Associate of the Station of Experimental Evolution of the Carnegie Institution of Washington, D. C.

Discussion:

By Prof. Roswell H. Johnson, Lecturer in Eugenics, at the University of Pittsburgh.

12:00 *Business Meeting.*

2:00 *P.M. Clinics.*

Dr. Lloyd S. Lourie, Chicago, Ill.

The "Concealed labial" arch with spring extensions, alone and in combination with the Lingual Arch. Practical application.

- Dr. John V. Mershon, Philadelphia, Pa.
Technic of the Lingual Arch with special reference to the use of auxiliary springs.
- Dr. Glenn F. Bowen, Pittsburgh, Pa.
A conservative method of elevating Impacted Cuspids.
- Dr. Samuel J. Lewis, Kalamazoo, Mich.
A Cast Attachment for Bite Planes and Retainers. A practical application. Casting Technic.
- Dr. Edward L. Mitchell, Indianapolis, Ind.
A Lingual Attachment allowing variable movement of one anchor tooth.
- Dr. D. Willard Flint, Pittsburgh, Pa.
Short cuts.
- Dr. Guy B. Steadman, St. Paul, Minn.
Slip Tubes, permitting the use of the ribbon and plain arches interchangeably. Secondary Retention for Class II. Div. 2 cases, using inclined planes.
- Dr. F. S. Stillwell, Cincinnati, Ohio.
Results with the Ribbon Arch. Slides.
A Modeling Compound Technic.
- Dr. Harry J. Horner, Pittsburgh, Pa.
Case showing extensive bodily movement of anterior teeth separated by three supernumerary teeth.
- Dr. L. G. Singleton, Pittsburgh, Pa.
Facial variations illustrated diagrammatically.

6:00 P.M. *Dinner at the William Penn Hotel.*

Lecture:

"Hunting Big Game in the Rocks," illustrated throughout with actual scenes from work carried on by the Carnegie Museum of Pittsburgh and other scientific institutions. 120 colored slides. By Arthur S. Coggeshall, Scientific Staff, Carnegie Museum, Pittsburgh, Pa.

Dr. E. Santley Butler, Secretary.
576 5th Avenue, New York City.

Notes of Interest

Dr. F. W. Beesley wishes to announce the opening of offices for the exclusive practice of orthodontia at 501 Mack Building, Denver. Formerly associated with Dr. R. H. Ketcham.

Dr. Charles A. Spahn announces the opening of his office at 560 Fifth Ave., New York City, for the development of dental arches and correction of malposed teeth.

Dr. Harvey Stallard and Dr. Guilhermena Mendell Stallard, formerly of Minneapolis, Minnesota, announce the opening of their office at 247 Spreckels Building, San Diego, California. Orthodontia exclusively.

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ORIGINAL ARTICLES

THE REMOVABLE LINGUAL ARCH AND ITS RELATION TO THE ORTHODONTIC PROBLEM*

BY J. V. MERSHON, D.D.S., PHILADELPHIA, PA.

IN general the normal development of any part is dependent upon its proper nutrition, and this is dependent upon the functional activity of this and other related parts." (Conklin, "Heredity and Environment.")

Until recently orthodontia has been studied as a tooth problem, taking into account the size and shapes of the teeth together with arch form and cusp relationship, and the theory has been evolved that teeth moved from malocclusion to normal occlusion and with proper relationship of the cusps and inclined planes established, the mechanical relationship, by virtue of the mechanical locking of the cusps and inclined planes, will cause these teeth to remain in position of normal occlusion.

From this theory one would be led to believe that cusp relation is a primary force and a controlling one. This would be true if the teeth were implanted in a piece of metal which is fixed so that no change could take place in the supporting structure or if the teeth in the opposing jaws were held rigidly in occlusal contact by well-developed muscles. But the bone supporting the teeth is plastic in nature, subject to many influences and constantly changing, and the muscles which hold the teeth in occlusion are not rigid, but to the contrary in most of our patients are very flabby and relaxed. Too frequently this theory fails and the teeth drift to their former positions. So frequently indeed is this true that the orthodontist is continually groping for a remedy for his failure, and he has gone but little farther than the field of orthodontic appliances. While there is no doubt that some appliances are more efficient than others

*Read before the Pacific Coast Society of Orthodontists, San Francisco, February 17, 1920.

and some men are better technicians than others, it is my belief that the solution of our problem will never be found simply by the use of orthodontic appliances.

We must approach the problem from an entirely different angle. Primarily, the orthodontic problem is not a tooth problem and, consequently, is not primarily a problem of occlusion, but it must be studied from the standpoint of development and its relation to the functional forces.

"One of the greatest and most far-reaching themes which has ever occupied the minds of men is the problem of development." (Conklin.) It is well known in biology that all form depends on function and our problem is essentially a study of form. The human body is composed of certain well-known tissues, and very early in our life's history these tissues through certain functional changes are formed into organs, and it is through the function of these tissues and organs that we have the developing human body. Most of the organs and tissues of the body are developed under their own function.

There is a definite functional relationship between organs and tissues, so is there a functional relationship between the different organs. If one organ of the body should partially fail in its function, it would have a retarding influence on other organs associated with it; so with this interdependence of organs we have the body as a whole developed perfectly or imperfectly according to organ function. "The human body is an exceedingly complex structure. Many organs must originate, grow, develop, and be co-ordinated and adjusted in one body. We often forget or underestimate the importance of growth. If an organ is undersized it is a source of weakness in the body. This is evident of heart and lungs, but equally true of all organs. Bone and muscle must grow well in the child before they can be developed and hardened by the boy and girl." (Tyler, "Growth and Education," page 55.)

In our study of the oral cavity as an organ, we must study it in its relation to the other organs of the body. It is affected in its growth and develops just in proportion as we have normal or abnormal function of the associated organs. The teeth are peculiar in that they lack the power of repair and are fully formed before they begin to perform the function for which they were designed. It is not until they are fully formed and erupted into occlusal contact, that they become an active functional factor in general development. Through the interrelationship with the muscles of mastication and the supporting bones the development of the tooth in its bony crypt is a normal function, and a factor in bone development prior to and during its eruption in so far as it is part of nature's original plan. The negation of this is evident in the lack of development seen when teeth are congenitally missing. The tooth on erupting has no power of directing itself into normal occlusion; it can only occupy such position in the dental arch as the associated tissues together with the developing bone in which it is located place it. The mal position of a tooth may be largely established before the tooth starts to erupt. So for these reasons I claim that primarily the orthodontic problem is not a tooth problem, but that malocclusion is undoubtedly the result of a functional disturbance in bone development together with its associated tissues.

The teeth depend on the osseous tissues for their support and to hold them in occlusion whether in normal occlusion or malocclusion. Tooth occlusion is

secondary or a symptom indicating only to a degree the variations in the development of the bones of the mandible and maxillæ. Our problem is a much larger one than simply moving teeth into normal occlusion with an orthodontic appliance, and we will have to look for help in many of our cases in some other field of medical science.

Is it possible to correct all cases of malocclusion? Can we correct all cases and retain the teeth so that they will not relapse? Is it reasonable to assume that in a case of faulty development of both mandible and maxillæ in a child with very narrow arches and teeth badly crowded, with flabby muscles, anemic, generally poorly developed and underweight, we can restore with orthodontic appliances such a mouth to 100 per cent perfect and retain it with the rest of the child only 80 per cent normal in its development? In spite of the fact that we cannot do so, we are still using orthodontic appliances and will continue to use them.

While orthodontic appliances will continue to be indispensable, so long as in the nature of the circumstances we are compelled to correct malocclusion by mechanical means, a proper comprehension and appreciation of the underlying principles of development involving the relationships of function to form must necessitate the use of orthodontic appliances so constructed and adapted that they shall become auxiliary to and co-operate with the developmental forces involved in the orthodontic procedure and not obstruct or hinder their normal action.

In the selection of an appliance to produce bone development and tooth movement, we must remember there is an interrelationship of function between the teeth and the peridental membrane, the bones supporting them, the muscles of the oral cavity, the nervous system and the circulation. The appliance to produce the proper stimulus to the tissues supporting the teeth to be moved, must do it in such a way that this interrelationship of function will not be disturbed. Each tooth is a unit and a law unto itself, having motion by virtue of the peridental membrane, which becomes operative in mastication, and through the action of the lips, cheek and tongue. This motion in turn reacts on the bone and its supporting tissues. If this motion is denied the tooth by a rigidly attached appliance, the supporting bone degenerates because the bone and tooth are robbed of their function; or when an appliance with which the tooth is being moved is so rigidly attached to the tooth that the movement is a positive one and the tooth is entirely under the control of the appliance, it destroys the functional relationship between the tooth and the rest of the tissues, and when the appliance is removed the tooth function is so disturbed that the tooth will not remain in its new position. By virtue of this functional interference, an unbalanced functional force is established which is very difficult to overcome, and we have difficulty in retaining the tooth in the position to which we have moved it. In selecting an appliance, the first requisite is that it must not interfere with the function of the teeth or any of the associated tissues or organs of the oral cavity.

As our problem is a developmental one due to functional disturbance, before we attempt to direct development in the dental arches of growing children, we must know the direction in which the development is taking place. In our efforts to produce growth by pressure artificially applied to the teeth with a me-

chanical appliance, so that by bone development these teeth may be carried to their correct positions according to our standards of occlusion, the amount of pressure to apply is rather difficult to determine. Of course the ideal would be that amount which corresponds with the normal growth force in developing bone, but this we have no means of measuring; so the smallest amount of pressure we can apply and control, which will cause bone development and cause the tooth to change its position, would approximate the normal force of development as closely as it is humanly possible to estimate it.

Since development in the dental arches is a general enlargement forward and outward and occlusally, this would indicate that if we place an appliance on the lingual surfaces of the teeth we at least would not interfere with development, as the normal direction of growth would be away from an appliance so placed. When we apply gentle pressure to a tooth sufficient to stimulate bone growth and tooth movement, after the tooth has moved beyond the influence of the appliance, growth does not suddenly stop but continues for a long time as the result of the stimulus received from the appliance. It can be readily seen therefore that an appliance rigidly attached to the buccal and labial surfaces of the teeth would have a retarding influence on this continued growth and tooth movement.

DEVELOPMENT OF THE REMOVABLE LINGUAL ARCH

With these thoughts in mind, I wish to present for your consideration the removable lingual arch, which closely approaches the ideal appliance in accordance with our modern conception of tooth movement in form development. The removable lingual arch is an arch wire of suitable size adapted to the lingual surfaces of the teeth. It is attached by means of a lock to metal bands cemented on the anchor teeth, usually the first molars, through which with its various auxiliary spring attachments stimulation is applied to the teeth causing developmental changes and tooth movement.

With me the lingual arch used removably has been and still is in the evolutionary process. I first used it in January, 1909. At that time it was used with round horizontal tubes soldered on the lingual surfaces of the molar bands with the distal end of the tube closed, and I am at times still using them. With this style of tube it was very difficult to remove and replace the arch wire. To overcome the difficulty, a round vertical tube was used locking the arch wire in the same manner as it is done today. The tendency with the tube thus used was to rotate the molar teeth even though the arch wire was extended well back on the molar band. When Drs. Angle and Young brought out the Young-Angle lock, using an elliptical vertical tube on the molar band, that helped to solve the problem, but the post would move in the tube and again it would cause the molars to rotate slightly. To overcome this I developed the half-round tube, which I used first in June, 1915, and have been using it on molar bands for the purpose of attaching the lingual arch ever since.

DESCRIPTION OF THE LINGUAL ARCH

The arch consists of one large main wire, a lock, of which the main wire is a part, and auxiliary springs. The lock (Fig. 1) is composed of the half-round

tube soldered to the molar band in a vertical position, a post which accurately fits the half-round tube soldered to the main arch wire, and a smaller wire, soldered to the main arch wire, passing under the half-round tube, locking the arch in place; this latter we call the lock wire.

The materials used in the construction of the main arch, the auxiliary springs, and the lock, the half-round tubes and posts are all alloys of gold and platinum, which possess great spring, that is retained over a long period of time under stress, and can be readily softened and retempered again. Several of the manufacturers have produced alloys possessing these qualities.

In selecting the material and the sizes of wire, use the smallest possible variety of material and standardized sizes. For the main arch wire 36/1000ths or No. 19 gage B. & S. after long experience has been adopted; for the lock wire 26/1000ths is the best size; for the auxiliary springs after many tests 22/1000ths. has proved without doubt the proper size. The half-round tubes I have used in many different lengths, but have at last decided on one size exclusive of all others, namely, 8/100ths of an inch. The half-round wire, which comes in six-

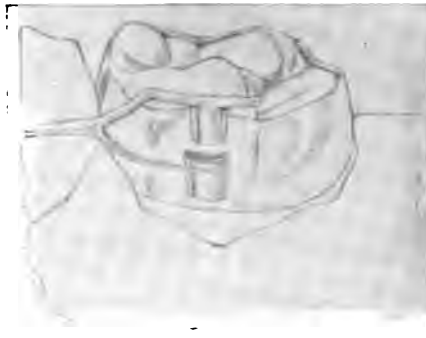


Fig. 1.

inch or foot lengths, should of course always fit the tubes accurately. If it does not fit accurately do not use it, as it will cause trouble later on.

CONSTRUCTION OF THE ARCH

The arch is constructed on a plaster model with molar bands which have been fitted to the natural teeth, with half-round tubes soldered to their lingual surfaces and transferred to the corresponding teeth on the plaster model. The main arch wire is then bent to conform to all the inequalities in the dental arch produced by the irregularities of the teeth, and should extend distally beyond the half-round tubes one-eighth of an inch. Slightly mesial to the tube we make a slight step in the wire by bending it first toward the gingiva, then again parallel with the gingiva. Place the arch wire very carefully in its correct position on the model and with a sharp instrument mark the arch wire opposite the tubes, then proceed to solder, free hand, the half-round post wire to the main arch wire opposite the marks, cutting it off the proper length for the half-round tubes. We now place one of the posts in the tubes. Should it not lie correctly on the model, remove the arch, and with two pairs of Dr. Young's pliers by grasping the wire on opposite sides it can be twisted to its desired posi-

tion. Proceed with the opposite side in the same manner. Replace the arch with both sides in the tubes. Should any part of the arch stand off from the model, it can readily be brought to place by heating this spot to a cherry red and while hot pressing it home with a suitable instrument and holding it there until it sets. The arch is again removed from the model and the lock wire is soldered to the main arch wire, just mesial to the post and bent to pass gingivally to the tube where it is cut off. The arch is now ready to be placed in the mouth.

PLACING THE ARCH

Remove the anchor bands from the model and cement them on the teeth. In trying the arch in the mouth, grasp the arch on the left side in the region of the half-round post with a pair of How pliers, and place the post in the tube on the left side. The arch should lie in its proper position, with the half-round post on the opposite side parallel with the half-round tube (Fig. 2-A). Should it not, twist or bend the arch until it lies correctly. Remove the post from the tube on the left, then place the right side post in the tube. If the post on

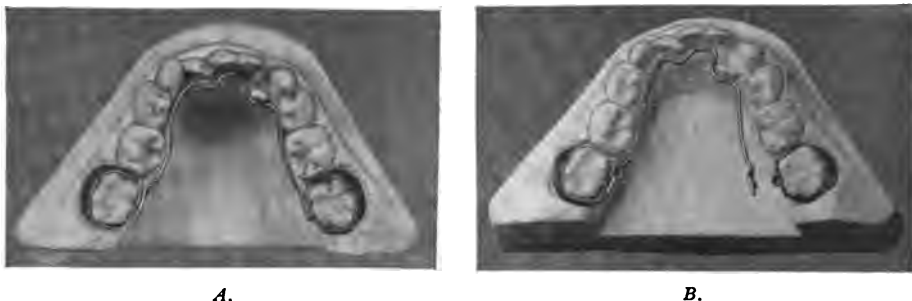


Fig. 2.—A, Showing correct position of lingual arch; B, showing incorrect angle of the post.

the left side drops into place with the tube, then the arch is ready to be locked in place.

LOCATION OF HALF-ROUND TUBES

The tubes should be placed on the lingual surfaces of the anchor bands, usually in the center of the band mesio-distally in both upper and lower jaws. In the lower jaw they should be placed as near the occlusal edge of the band as possible, allowing only sufficient distance between the occlusal edge of the band and the top of the tube for the arch. The tubes are so placed for the reason that the post is easier to place in the tube; if it is too far toward the gingiva, it is difficult to see the tube in the lower jaw on account of the tongue and saliva. In the upper jaw the tube should occupy the same position mesio-distally, but should be placed as near the gingiva as possible, otherwise the lingual cusps of the lower molars will come in contact with the arch and the continuous biting on it will eventually cause the arch to break.

PROPER LOCATION OF THE ARCH

The arch should occupy a position on the lingual surface of the teeth as close to the gingiva as possible. The arch when first placed in the mouth should be passive, the patient being allowed to wear it long enough to become entirely

accustomed to it, usually a week. During this period children are more likely to play with the arch with the tongue and fingers than thereafter. Therefore very strict caution should be given both patient and parent regarding this evil, as well as against eating sticky candy. After these precautions I seldom have trouble, but should I have, at the next visit I wire the arch with a fine ligature wire to some favorable tooth, and this usually cures the trouble after the patient becomes accustomed to the arch.

USE OF THE ARCH

The force necessary to produce tooth movement with the lingual arch is obtained in three ways: first, by straightening out the inequalities in the arch

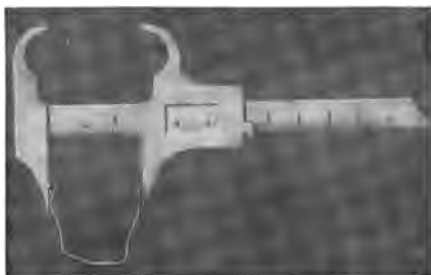


Fig. 3.

wire; second, by auxiliary springs soldered to the main arch; and third, by stretching the wire by means of the wire-stretching pliers.

At the next visit after placing the arch in the mouth, which is usually the next week, the arch is removed from the mouth. This is accomplished by tak-

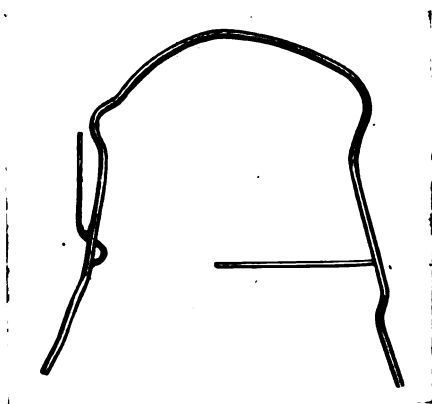


Fig. 4.

ing a suitable instrument and bending the lock wires from under the tubes on both sides, and the posts teased out of the tubes. With a pair of calipers, such as shown in Fig. 3, measure the distance from one half-round post to the one on the opposite side. This is absolutely necessary, especially if we intend to make a change in the main arch before replacing the arch, being sure to remeasure to see that the distance from one post to the other is the same as when removed.

At times it is wise to take a measurement in the region of the first bicuspid as well. If you are treating the case by taking the inequalities out of the main arch, which were made to fit around malposed teeth, a pair of flat-nosed pliers are best adapted for this work. In taking out a curve that fits around a tooth make but little change each time, remembering that you are only stimulating growth, not pushing the tooth. In removing a curve from the arch it not only causes the arch to bear a little harder on that particular tooth, but it slightly enlarges the whole circle of the arch.

THE AUXILIARY SPRING

The auxiliary spring is a small wire soldered to the main arch wire for the purpose of applying a gentle pressure to a tooth. The spring (Fig. 4) is usually soldered to the gingival side of the arch, and at right angles to the main arch, using 14-k. solder, then bent in the direction in which we wish to apply force. The reason for soldering the spring at right angles to the arch and bending it is that, in soldering, the high heat, especially with a high karat solder, removes

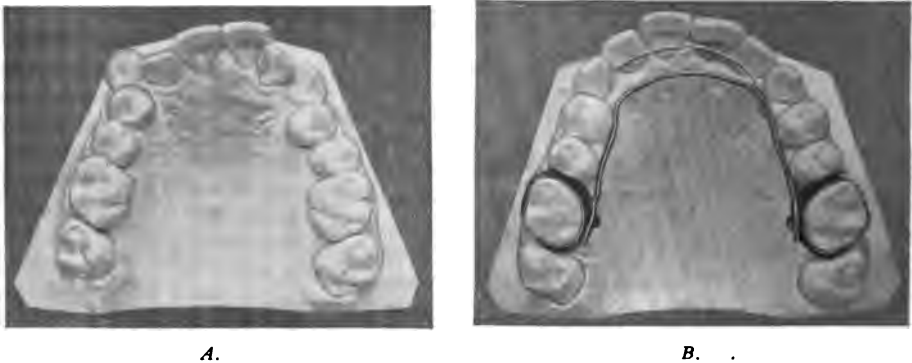


Fig. 5.—Showing the case before (A) and after (B) the use of the spring.

the temper from the wire, while the bending to correct position restores the spring temper.

The longer I use the lingual arch, the more I find myself using the auxiliary springs for development and tooth movement, using the main arch to follow up and bring about the general conformation of the dental arch. The auxiliary spring made of springy wire, 22/1000ths, properly attached to the main arch as a method of applying a stimulus to the teeth for the purpose of producing development and tooth movement very closely approaches the normal functional forces of development, and it has been my experience that teeth properly moved by use of the auxiliary spring have not the tendency to return to their former positions.

The most of our work in orthodontia consists in the treatment of under-developed or mal-developed dental arches, and we have two well-known conditions to deal with in many of our Class I cases: one in which the lateral teeth are almost in contact with the first bicuspid on one or both sides, leaving the cuspid teeth labially placed and very conspicuous; and second, a type where the arches are very narrow, requiring development in the bicuspid and cuspid re-

gions. For both of these types the auxiliary spring is most efficient. The forward development of the anterior teeth we accomplish in two ways: first, by attaching a spring to the gingival side of the main arch opposite the first bicuspid teeth at right angles to the main arch (Fig. 5-B), then bending the spring forward in a very short bend forming a small loop, and curving it around to correspond to the anterior curve in the main arch, allowing it to extend so that

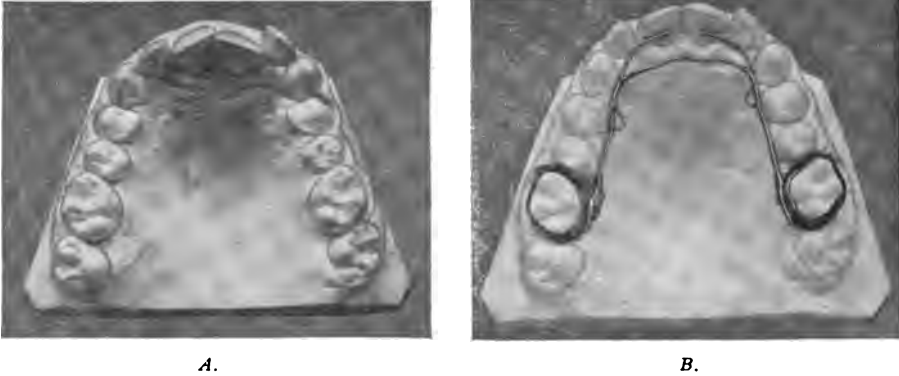


Fig. 6.—Showing the case before (A) and after (B) the use of the springs.

it will engage the lateral tooth on the opposite side. Another method is to use two springs attached to the main arch, one on each side opposite the bicuspid teeth, bending them forward to engage the lateral and central incisors on their respective sides (Fig. 6-B).

To produce lateral development in the bicuspid and cuspid region, we attach the spring to the main arch wire opposite the space between the first and second

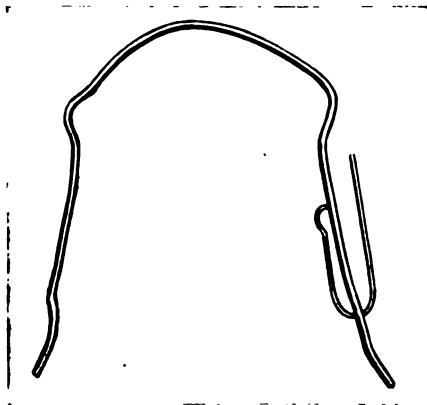


Fig. 7.

bicuspids, bend the wire distally, parallel with the main arch wire, almost to the first molar, then make a short loop bending it again toward the cuspid tooth and leaving it as long as required according to number of teeth to be moved. This gives us a compound loop in which the pressure is the same on all the teeth (Fig. 7).

ROTATING TEETH

The auxiliary spring is most efficient for rotating teeth. To produce rotation without banding the tooth, let us take as an example the upper first bicuspid, which frequently erupts with the lingual cusp rotated mesially (Fig. 8). This is very easily corrected by soldering a spring to the main arch, opposite the approximal space between the first and second bicuspids. Bend the wire mesially, forming a half circle with the free end of the spring wire engaging the first bicuspid and applying pressure on the mesial surface opposite the lingual cusp. The same

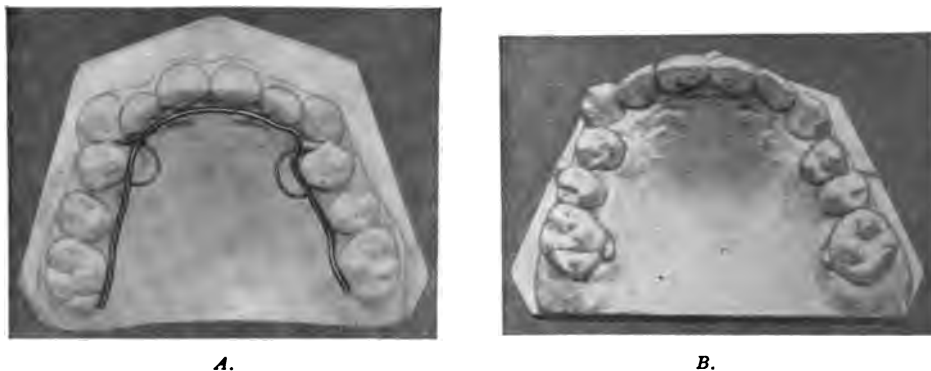


Fig. 8.—*A*, With springs in position; *B*, showing result of the use of the springs.

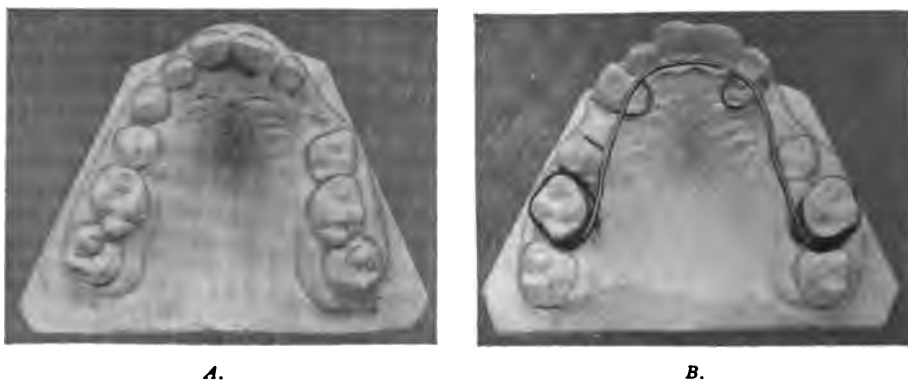


Fig. 9.—Showing the case before (*A*) and after (*B*) the springs were in position and the result.

principle of attachment can be employed for moving teeth mesially or distally, also for the purpose of opening spaces.

TO OPEN SPACES FOR IMPACTED OR MISSING TEETH

This is accomplished by the use of two auxiliary springs soldered to the arch, one the width of a tooth distal to the place we wish the space, attaching the springs the width of two teeth apart. The one most distal curves mesially to engage the tooth distal to the space (Fig. 9-*B*). With the loose end of the spring flattened by diskings the sides, this end usually passes to the gingival side of the arch to engage the teeth.

To move the anterior teeth mesially or distally, solder a spring to the arch about fifteen one-hundredths of an inch distal to the tooth to be moved (Fig. 10). Bend the spring in a curve, passing the loose end, which should always be flattened by diskings both sides until it is very thin, to the gingival side of the arch, and if properly adjusted (this is most important in all of the auxiliary springs) it will pass between the tooth and the soft tissues at the gingival space in the same manner as a thin band. Tooth movement is very easily accomplished if slight pressure is applied to the tooth by tightening the spring from time to time.

One of the most successful methods for rotating teeth is to band the tooth to be rotated in the usual way, with a spur attached to the labial side of the band (Fig. 11-A). With a spring wire soldered to the arch some distance from the

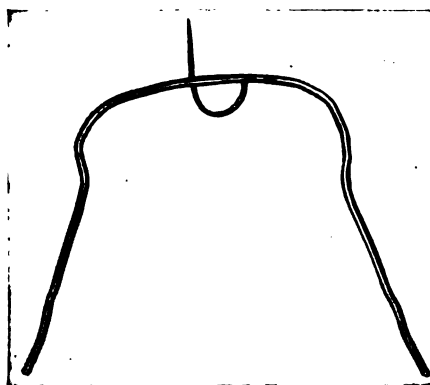


Fig. 10.



A.



B.

Fig. 11.—Showing the case (A) with springs in position, and (B) the final result.

tooth to be rotated, bend the spring almost parallel with the main arch. On the loose end, which should now stand some distance from the arch, place a fine ligature wire, which, passing through the gingival space, engages the spur on the band. After this the ligature wire should be tightened until the spring is in contact with the main arch. It is well to make a hook at the end of the spring wire so that the ligature will not slip off. The tendency of the spring wire to return to its original position will cause the tooth to turn on its axis.

AUXILIARY SPRINGS

I have only mentioned a few ways in which the auxiliary springs may be employed; however, there is no limit to their use and the variety of methods of employing them. The auxiliary spring wire should always be as long as we can control it, as the pressure is more gentle, and it will be surprising to see what a slight stimulation is required to produce bone change (Fig. 12). At times the auxiliary spring may cause the main arch to be pushed occlusally. In such a case the main arch wire should be stabilized by ligating it to a tooth favorably placed.

ANCHORAGE

A word of warning regarding the anchor teeth. There may be times when it will be necessary to band an anterior tooth or in some other way to stabilize the anchor teeth, but very seldom. If we are interfering with our anchor teeth, it is evident we are applying too much pressure and undertaking to produce

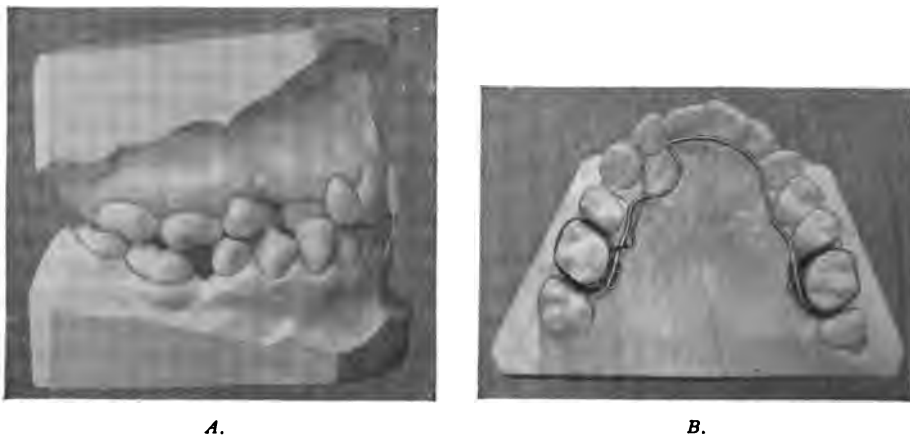


Fig. 12.—A, Showing inlocked cuspid; patient twenty-five years of age. B, Tooth brought out with spring.

tooth change faster than development will take place. Almost every one in beginning to use the lingual arch applies too much force and adjust the arch entirely too often.

FREQUENCY OF ADJUSTMENTS

Adjustments in the lingual arch, unless for some special condition or reason, should not be more frequent than one every four to eight weeks. We are treating growing children in whom nature through some functional disturbance has failed to develop the dental arches according to our conception of normal form. In a child we should not undertake to stimulate development and tooth movement faster than normal growth would take place in a healthy growing child; otherwise, we will undoubtedly destroy the harmony of function between the tooth and its supporting bone, and establish an unbalanced functional force which is very difficult to correct; and we wonder why our cases relapse. Growth continues long after the appliance has spent its force and the teeth will continue to move for a considerable time as the result of this stimulation transmitted

through the teeth to the bone cells with the appliance, the teeth frequently moving entirely free from the appliance. This is what I would call a normal harmonious functional development.

"A general characteristic of protoplasm is the capacity of storing up or registering the affects of previous stimuli. A single stimulus may produce changes in an organism which persist for a longer or shorter time, and if a second stimulus occurs while the effect of a previous stimulus still persists, the response to the second stimulus may be very different from that to the first." (Conklin.)

If we would only remember that teeth move through a process of growth, that the appliance does not push the tooth, and that there is always an effort on the part of nature to move the tooth into its correct location! Place an appliance on the teeth of a skull and apply pressure; the teeth will not move. Why? Because there is no growth taking place.

Growth is the result of life. We cannot handle the orthodontic problem entirely to our own liking and make development adapt itself to whatever appliance we see fit to use, but we must adapt our appliance to the laws governing growth and development. There are certain laws governing growth. Function is the result of the active force in growth, development is growth plus function, and form is the result of growth plus function, plus development.

With our appliance we do not manufacture growth; we only stimulate an already living, growing, human being. In the past there has been entirely too much tinkering done with the dental arches. I have many patients wearing lingual arches during the vacation season whom I do not see for three months, and when they return the development in the dental arches is so great that the appliance is very loose in the mouth and not in contact with the teeth at all. In the average case that I treat, taking the whole period of time they are under my care, I leave the appliances off almost as much as the child wears them, allowing the whole dental machine to develop under its own function and not by artificial stimulation.

RETENTION

When teeth have been moved from malocclusion to normal occlusion and the proper cusp relationship established the mechanical locking of the cusps of the teeth is supposed to retain them in this position, but on removing our retaining appliance those teeth frequently return to their former position. If mechanical locking by means of this cusp relationship is such an important factor, why do these teeth relapse? The teeth themselves have no power by which they can retrace their steps. Our deduction then would be that we have a force operating in the tissues supporting the teeth which causes them to relapse to their former position, and that these forces supporting and surrounding the teeth, if I may so call them, are greater forces than the mechanical locking of the cusps. I do not mean to discount the value of cusp relationship, for it is absolutely necessary, but I do mean to say that it is not the controlling factor in retaining a denture in normal occlusion where the teeth have been moved from malposed positions. All forces are important and essential but we must have a harmony established between all the forces which operate or functionate. So in moving teeth with an appliance we must use the utmost care to see that the functional

relationship between the tooth and the bone supporting it with its associated tissues has not been disturbed.

CONCLUSIONS

Our problem is one of development; it is a study of growth and the functional forces of growth which control development; the teeth and their occlusion are an incident thereto. We are treating impaired function which results in defective development and we are erroneously endeavoring to do it artificially with a mechanical appliance.

In recommending the removable lingual arch for this purpose, it is not to be considered a universal appliance, and is at times used in connection with the labial arch, especially in Class II and Class III cases. The making and using of the lingual arch are most difficult, but it is a most efficient appliance if properly used. With the lingual arch and the auxiliary springs we can apply a pressure to a tooth which approaches the normal growth force as closely as it is humanly possible to judge, so that we can produce development and tooth movement without destroying the harmony of function between the tooth and its supporting tissues.

DISCUSSION

Dr. Robert Dunn, San Francisco, Cal.—In this discussion of Dr. Mereshon's paper, I wish it to be understood that wherein I may have different views, what I say is not in a spirit of antagonism, but with a kindly feeling. It is only the desire to point out possible errors as to his theories, and to have others more clearly defined—to draw to your attention what appears to me an inherent weakness and the limitations of the appliance he so ardently advocates, and to use this opportunity to endeavor to set aright false impressions rapidly gaining ground through extravagant claims of others, as to the discovery in this appliance of a panacea for all our troubles. Most happily, the essayist makes no such claims.

We are, I believe, all in accord as to dependency of normal development upon proper nutrition and functional activity, particularly functional activity; but I do not remember that we earlier students of Orthodontia were taught or led to believe that the mere mechanical locking of the cusps and inclined planes was sufficient to cause the teeth to remain in normal occlusion. To the contrary, normal development and proper functional activity were prerequisite.

There can be no question but that there has been too much dependence placed upon the orthodontic regulating appliance, and like the essayist, I believe our problems will not be solved simply by their use, and that they must be studied from the standpoint of development and its relation to functional force.

The essayist states that most of the organs of the body are developed under their own function. This is particularly true, I believe, of the dental organs, but that they should be likened in their development in their entirety, to other organs of the body, is, I believe, a mistake. And as to the oral cavity, as an organ, being affected in its growth and development in proportion to normal and abnormal function of associated organs, that has, in my opinion, yet to be substantiated. Therein lies its difference to other organs of the body.

From the remark of the essayist in the course of his paper, it is assumed he is referring, in the main, to the permanent denture. In any case, taking him literally, we know the teeth begin to functionate actively before they are fully formed. The fact is, they should begin to functionate as soon as the cusps are through the tissues. He states that, for various reasons mentioned, primarily the orthodontic problem is not a tooth problem, and that malocclusion is undoubtedly the result of a functional disturbance in bone development together with its associated tissues, and that tooth occlusion is secondary, or a symptom, indicating only to a degree, the variations in the development of the bones of

the mandible and maxilla. If such be true, why is not the deciduous denture affected in like proportion to the permanent? Why does this disturbed function in by far the largest percentage of our cases, occur or become most apparent during the development of the permanent denture? Is this disturbed function due to intrinsic or extrinsic causes? It certainly does not seem reasonable that the deciduous denture should be affected so little, and yet the functional disturbance be due to intrinsic forces or functional disturbance in other organs of the body. In my opinion it will be found, after due consideration has been given to development and its relation to functional force, that the disturbed function in the dental organs is caused by the lack of proper extrinsic force, or in other words, nothing more or less than insufficient or lack of proper use, from the time the infant is old enough to stick its fists into its mouth, to the full eruption of the permanent teeth. And because of this, I believe the orthodontic problem will remain as much a tooth problem as a developmental one. Furthermore our troubles will be lessened but little by the further study or knowledge of development, or help from other fields of medical science, unless we can reform people as to their luxurious ways of living, and that does not look very promising.

I might state here that in my experience the larger percentage of the children I have been called upon to treat, have been, other than their teeth, anything but abnormal. In fact, many of them, almost one hundred per cent, were normal. I quite agree with the essayist as to the necessity of constructing and adapting appliances that will become auxiliary to and cooperate with, the developmental forces, so far as it is possible, and still have them effective. But that they can be constructed without some rigid attachment and still be effective, in the larger percentage of cases, is a mechanical impossibility, and I question the statement that because of the use of so-called rigid attachments, the tooth is robbed of any of its function, or that the supporting bone degenerates to any appreciable degree; unless through faulty manipulation of the operator, and in that case, that would occur with any appliance, particularly so in the molar region with the lingual arch appliance, when the half-round tube and shaft is used as a molar attachment. I cannot see wherein the application of force from the lingual aspect would be any different than that applied from the bucco-labial aspect; one is a push, the other a pull; neither can the amount of force be more easily determined in one than in the other; nor can it be controlled to a better advantage in the lingual appliance than in the bucco-labial, and the fact that the enlargement of the dental arches is forward and outward does not necessarily contraindicate the use of bucco-labial appliances.

As to the advantages and disadvantages of the bucco-labial and lingual appliances, I will say, that in the former, it is adaptable to a wider range of cases, with molar anchorage kept more easily under control, a most important feature in any appliance; for it is in this region that we will find the greatest functional disturbance that is causing us so much trouble. Its disadvantages are mainly from a prophylactic and esthetic standpoint, and if not kept under the closest surveillance, it is liable to cause irreparable damage to tooth structure. The use of bucco-labial appliances, of course, necessitates the placing of retaining appliances after occlusal relations have been established.

The lingual appliance, unlike the bucco-labial appliance, is, from the esthetic standpoint, most ideal, and from the prophylactic point of view, is less liable to cause etchings of tooth structure, because of the action of the tongue and flow of saliva. In my hands it has proved a most ideal appliance in developmental work during the period of the full deciduous denture, in those cases of mixed dentures wherein the permanent teeth are in their first stages of eruption, in those simple cases of Class I of the full permanent denture, and in all of cases in which arrested vertical development is not present. In other types of cases, the appliance, in its present stage of development, is limited in effectiveness; and in all other cases it must be supplemented by other appliances.

It is a most ideal retainer; slight re-adjustments, when necessary, being made without difficulty.

Arrested vertical development in molar and premolar region is a most potent factor in producing malocclusions of the teeth, and is present to a greater or less degree in a very

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DISCUSSION

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Arrested vertical development in molar and premolar region is a most potent factor in producing malocclusions of the teeth, and is present to a greater or less degree in a very

large percentage of cases, and it is in such cases that the appliance is particularly lacking in effectiveness, for in its use it is impossible to control this development. Its greatest weakness is in its molar attachment. Being a rigid appliance, it does here just what the essayist claims an appliance should not do, namely, interfere with the developmental forces, for if the greatest care is not exercised in the manner of placing, and in the force exerted by the little auxillary springs, molar displacement is sure to result. Again, when occasion calls for an adjustment of the lingual arch, or repairs to be made to the same, the accurate realignment of the close fitting tubes and shafts, in the absence of suitable testing instruments, is practically impossible, resulting in molar displacement, usually in a direction not desired by the operator, and the degree depending upon his skill.

Much, however, may yet be done to eliminate this difficulty, mainly in perfecting an instrument to accurately gauge relative positions of tubes and shafts. When this is accomplished, this lingual arch appliance will prove most ideal in those cases as outlined above.

Dr. James D. McCoy, Los Angeles, Cal.—I am tremendously interested in what Dr. Mershon has had to say. In justice to him and to us all I wish we might have several months before attempting to put our thoughts into definite form. He has hit the nail on the head when he has classified the orthodontia problem as one of nutrition, and the sooner we learn more about that particular problem the better off we shall be. I have been faithfully endeavoring to follow out his principles in the use of the lingual arch over quite a period now, and the more I use it the more amazed I am at its possibilities. I made the fatal mistake about which he cautions us, i.e., I applied my force too rapidly and too frequently. I had the good fortune to have as a balance wheel in my office, my brother, who is very skeptical and who is better balanced than I. He was quite skeptical at first regarding the lingual arch, but as time has gone on he has finally become converted and is now as enthusiastic as I am.

I think a very important feature of our success in using this appliance will be found in the materials we use in its construction. It is certainly one appliance which will not stand the abuse of using inferior materials. I am anxious to have a consultation with Dr. Mershon in regard to his latest findings with reference to the alloys and where we may secure those best adapted for the appliances.

When I first started to use the lingual arch I adopted this plan, and I think any of you who have failed to use the appliance so far, may do well to follow it. I only used it at first on the lower teeth in Class II cases where it is indicated as anchorage in using intermaxillary force. I have finally reached the point where I never use any other appliance in these Class II cases except the lingual arch, and as I become more familiar with it I find it applicable to a greater variety of cases.

Dr. A. H. Suggett, San Francisco, Cal.—At the Chicago meeting two years ago I heard Dr. Mershon's paper and saw his slides, and was much interested in his work. I had been tinkering a little with the lingual wire, but felt I had to have a stabilizer in front, but when I saw his work I was certainly impressed with the results he secured. It is necessary to use a stabilizer if you use a great amount of force, of course, and it seemed to me it was necessary to use a considerable degree of force. Then we began to doubt if it was necessary to use so much force. But a few years ago you know, we used 16 gauge arches, and Dr. Angle is quoted as saying to some students they could look up and study other problems but improvements on D Bands and the Expansion Arch already made were final. We came down from 16 to 18 gauge arches and to the pin and tube appliance with .030 wire. When J. Lowe Young gave his clinic in Chicago and told of this wonderful wire it seemed absurd, but still we were open to conviction and we commenced trying it, and at the time we got started on the 0.30 wire other men came out with .022 and .020 wire, and that seemed still more absurd. But when a man has shown the results that Dr. Mershon has shown, there can no longer be any doubt of the practicability of the method he follows, I think.

I may get results with one appliance better than somebody else, but that does not signify it is impossible to do the work with these other appliances, and we all realize that

we need less and less force. None of us can follow this paper to which we have listened and still doubt you can move those teeth with an almost infinitesimal force as compared with the old 16 gauge arch. We have mothers of patients coming in and telling us the children had to go every day to have the 16 gauge arches tightened up with hydraulic pressure. At Chicago one man showed a 14 gauge arch, and somebody asked why he did not have jack (?) there! The more force the better! But we get the results with the slightest pressure and are realizing there is something beside tooth movement. I returned from Chicago enthusiastic about it, and commenced talking with the fellows out here. I realized that was the coming thing. That interested the American Society of Orthodontists more than any other thing before the convention at that time. and we are happy to have Dr. Mershon here today to show us what can be done. Since I attended that meeting most of all the lower cases have been treated with the lingual wire, but I have not applied it so accurately nor so scientifically as Dr. Mershon has done it. But I would like something to keep me from pushing my cases so rapidly, and then I will make better progress. I am sure I shall be the gainer from what I have seen today.

Dr. H. L. Morehouse, Spokane, Wash.—I would like to express my appreciation of Dr. Mershon's paper. I have been using the lingual arch for two years—not so fully as the Doctor has shown us but along nearly the same lines, and the results have, in a majority of instances, been very pleasing. I fully realize now what I have partly felt before, but did not put into effect, i.e., that I should move teeth with less frequent adjustments. Doubtless I have made the adjustments less frequently than some others, but I am certain after hearing Dr. Mershon's paper, that is one of the greatest points in his success. I wish to thank him for the paper.

Dr. Leland E. Carter.—I hesitate to say anything regarding this lingual arch as I fear I might say too much. I am a lingual arch enthusiast and I use it in the majority of my cases. I started out by using the Jackson appliance, which I use very extensively to this day. I have used Dr. Mershon's appliance in a great many cases, but found some trouble in stabilizing the wire, so I got into the habit of using Lourie's method of attachment, and in order to get my adjustments (a little hint I got from Dr. Suggett) I remove the Lourie appliance in making my adjustment—by removing the bands. It is an easy thing to do when you have properly constructed bands and a good band remover. Because of the fact these adjustments should be made less frequently than with some other forms of appliances, this is not as much work as one might think. I have used the auxiliary springs a great deal. When I first used them with the Lourie attachment I had a rather disastrous result. I did not figure correctly just how strong the little wire was and how fast it would move those teeth, but very shortly I discovered I had better apply less pressure and make the adjustments less often. I have been much interested in Dr. Mershon's paper and welcome the opportunity I will have of seeing him demonstrate the construction of this appliance, as I feel it has its advantages in that it may be removed from the mouth and adjusted so easily.

Dr. Mershon offered no closing discussion.

TECHNIC OF CONSTRUCTION AND ADJUSTMENT OF THE PIN AND TUBE APPLIANCE*

BY GEORGE W. GRIEVE, D.D.S., TORONTO, CANADA

OVER a year ago a member of your society asked me to contribute something on the pin and tube appliance. He had seen a number of patients in my practice whose cases were being treated with this appliance. I was unable to accede to his request at that time. Again this year the same appeal came to me from your society, and while I am very diffident about presenting such an important subject, upon which so very little has been written, I feel that possibly some of the members may derive more or less benefit from my experience with this most excellent appliance.

I might say that this is my maiden effort in the way of a paper before a society of specialists, and I trust that those who hear it today, or read it later, if it should ever appear in print, will be charitable and remember that only the work of Him who created all things is perfect. I trust it will be received in the spirit in which it is given, and that while it may be imperfect in many respects, this paper, nevertheless, coupled with the discussion which it may provoke, will, it is hoped, be of some little assistance to many who are working in this fascinating field.

I shall endeavor to give as clearly as possible a technic for the construction and adjustment of this appliance, and will say here that one of the chief features of difference, as I use it, compared with others who have so far written upon the subject, is not original, but was suggested to me about three years ago by Dr. C. A. Hawley, of Washington. I refer to the half-round pin, which I now use to the entire exclusion of the round pin. I do not, as a rule, use loops in the arch in front of the molars, but obtain increase or decrease in the length of the arch as will be described in detail later.

I am not going to go into the history of the development of the appliance other than to say that, as introduced here, it is a modification of, and in some respects, to my mind at least, an improvement upon the appliance as originally introduced by Dr. Edward H. Angle, before the Alumni Society of the Angle School of Orthodontia, and published in the *Dental Cosmos* for March, 1910, under the title "Bone Growing." Further papers were presented by Dr. Angle before the Alumni Society of his school, upon this appliance and appeared in the *Dental Cosmos* for August, 1912, under the title "Evolution of Orthodontia—Recent Developments," and in the same journal for January, 1913, entitled "Further Steps in the Progress of Orthodontia." In July, 1913, before the American Society of Orthodontists, that expert technician, Dr. J. Lowe Young, contributed a paper entitled "The Technique of the Practical Application of the New Angle Appliance." This paper appeared in the *Items of Interest* for

*Read before the Alumni Society of the Dewey School of Orthodontia, Chicago, April 1-2-3, 1920.

November, 1913. A paper by Dr. Allen H. Suggett, of San Francisco, appeared in the February, 1917, number of the *International Journal of Orthodontia*, entitled "The Use of the .0225 Wire." This was a description of the pin and tube principle in a considerably modified form. The original appliance of Dr. Angle, as well as the modified form of Dr. Suggett, are also described in Dr. Dewey's book "Practical Orthodontia." This appliance has been referred to in articles by Drs. Rogers, Pullen and others, but, so far as I am aware, nothing has appeared in the magazines in the way of definite articles relative to its use other than as stated above.

In a paper by Dr. A. Fernald, Boston, which appeared in the *Items of Interest* for December, 1912, he described the use of square pins soldered to the arch and square tubes on the labial surfaces of bands on incisors and canines to get rotation and root movement.

Just here I would like to pay my tribute to the master mind which gave us in this appliance the most perfect instrument, in my opinion, for the correction of those cases which require a multiplicity of movements of crowns and roots, that has ever been introduced. It was my privilege, along with other members of the Alumni Society of the Angle School of Orthodontia, to receive personal instruction from Dr. Angle in his clinics at New London in 1911 and again in 1912 upon the construction and adjustment of his pin and tube appliance. He gave to those whose privilege it was to study under him, inspiration and ambition, and instilled into our very souls those high ideals which go so far to make success.

In the pin and tube appliance, as I use it today, while I have adopted some of the changes suggested by other men, I have also sought to eliminate some of those which Dr. Angle considered undesirable, and as presented here, it is the most efficient appliance for the treatment of complicated and difficult cases that I have ever used. I have applied it, in different forms, upon a large number of cases since 1911, and my feelings concerning it can best be described, if I may be permitted, by quoting from the paper of Dr. Young in 1913, in which he said: "Gentlemen, I wish to say to you at the beginning, in all seriousness, that if, for any reason, I were deprived of these delicate appliances I believe that I should give up the practice of orthodontia." And I might say, personally, that I would be very sorry indeed to discontinue my efforts in this most fascinating field of work. There are many difficulties each day which we must overcome, but without difficult problems to solve the interest would be gone, and we would rank only with those in menial vocations whose energies are directed from year to year with the sole purpose of "making a living." The height of the ambition of many in this latter class would be to in some unknown and mysterious way secure money enough to "live without working." Work is looked upon by many of these men as an "invention of the Devil," while to others, who see ahead a goal of accomplishment which requires earnest effort to reach, their work forms a large part of "the joy of living."

Wonderful results may be accomplished by the use of the pin and tube appliance, but the operator who has not the skill or inclination to exercise the most exacting technic should not attempt its use, for without extreme care in its adjustment serious damage may be done. Dr. Young said in his paper on

this appliance:—"Remember that the highest kind of skill is purchased only by the most painstaking kind of work."

The technic of construction of this appliance with the half-round pin is still more exacting than that with the round pin, but after completion of the application of the appliance, particularly where there are a number of rotations to be made (which, by the way, is nearly always the case), I feel its adjustment is more simple than with the round pins.

It has been said of the pin and tube appliance that the technic of its use is too exacting for the average orthodontist. I believe this is not true, and I trust that those present who have not tried it, and those who have only tried it half-heartedly will go home and work with it earnestly; your efforts will be wonderfully repaid; its efficiency is 100 per cent. I believe that the man who cannot master the technic of this appliance will not be very successful as an orthodontist. I do not mean by this that successful results cannot be obtained without its use, for in this city of Chicago there lives a man who can, I believe, place teeth absolutely where he wants them without fixed attachments to any teeth except the molars, but to do that, in my opinion, requires more skill than is necessary to successfully use the pin and tube appliance.

PLACING OF BANDS AND TUBES

All teeth which require root movement or rotation, with a few exceptions, should be fitted with plain bands, upon the buccal or labial surfaces of which are soldered half-round tubes. The tubes should be placed parallel with the long axis of the teeth, regardless of the extreme angle of inclination which any may occupy. The tubes on the molars should be similar in size to those recommended by Mershon for use with the removable lingual arch, and be .08" to .10" long, and placed a little mesial to the centre of the buccal surface of the teeth. Where the second molars are present, bands with tubes should also be placed upon these teeth, as well as the first molars, if the former require movement of their roots or rotation, or if these teeth are required as additional anchorage to carry out movement of the other teeth. In many cases it will be found that the upper second molars stand at an extreme abnormal angle, their roots requiring to be carried buccally; these can be very perfectly straightened up with this appliance, thus improving their occlusion with the corresponding teeth of the mandible, which are often found at a more or less opposite angle. The lowers usually require their crowns to be "tipped" buccally, which can be accomplished by soldering a spring of .025 wire at right angles to the arch to lie between the distal cusps of the first molar and the mesial cusps of the second and then turned gingivally and distally to lie against the lingual surface of the second molar. If their roots require to be carried lingually, which is rarely the case, then these teeth should be banded as for the uppers. Occasionally the upper second molars will only require to have their crowns "tipped" lingually, in which case the arch proper is carried back to lie against the buccal surface of these teeth, and a separate lock of .025 wire is used to hold the arch to place in the tube on the first molar. The bands upon the molars, where possible, should be carried beneath the free margin of the gum; the same technic may be applied in second premolars or upon any teeth which are particularly

short, but for the most part all other bands are made just wide enough to carry a tube .08" long and permit the arch wire to lie upon the band, as described by Dr. Angle in his original technic for the pin and tube appliance, and have space gingival to the tube sufficient to permit of a lock of .022" wire which may be required upon any teeth to be extruded or for the purpose of holding the arch firmly to place in the tubes. All bands should be so placed upon the teeth that the arch wire, when the corrections are all made, will be, as nearly as possible, in harmony with the normal dental arch, as described more minutely by Dr. Angle in his papers referred to above.

In the adjustment of the bands, a central incisor is fitted so that its band rests in the desired position and the tube is soldered to place. This band is now placed upon the tooth, and all other bands are adjusted to conform to this one, those on the laterals being placed just a little nearer the incisal end of the tooth than the centrals, to compensate for the slightly shorter tooth. The position of the tubes inciso-gingivally, or occluso-gingivally, is located by measuring with the Hawley gauge, or some other suitable instrument, the distance



Fig. 1.—Shows labial and occlusal views of casts of a boy twelve years of age. There were many teeth rotated, and roots standing, in some instances, at decidedly different angles. This case is nearly completed after a little over two years' treatment. The pin appliance, with half-round pins, is particularly adapted for the treatment of cases of this type.

on the selected central from the gingival end of the tube to the incisal edge of the tooth, and making all to conform to this one, the distance in the case of the laterals and premolars being slightly less than that of the centrals and canines.

In placing the tube for soldering, it is laid upon the center of the band, after having placed a small amount of flux upon band and flat side of tube, as nearly as can be judged parallel with the long axis of the tooth, using the approximal sides of the band as a guide. The flux is now fused to "fix" the tube; then a tiny piece of 18 karat solder is placed alongside the tube and slightly fused. (The seams of the bands have been soldered with 22 karat solder.) A straight piece of the half-round wire is now placed in this tube from the incisal end, to project gingivally about half an inch or more, and, holding the wire by the incisal end, the band is turned so that the lingual surface presents toward the operator. It can now be seen, by studying the line of the wire with the approximal sides of the band, whether the tube has been correctly placed. If not so placed, the wire is removed and the band held over the blowpipe so that the flame strikes the inner surface of the band under the tube, and with

a very fine instrument the tube can be "kicked" in the direction desired just as the solder fuses, as suggested by Dr. Angle. All work of soldering of bands and tubes may be done by a young lady assistant. The band is now placed upon the tooth, the wire inserted as before and studied as to angle. If the tube is found to be improperly placed, it is handed back to the assistant for correction. When the tube is found to be properly placed the solder is fused perfectly. This band is now placed upon the tooth, and the bands for the adjoining teeth, which have been in the course of fitting in the interval, are trimmed to lie in their proper position. All bands for incisors and some canines are slightly stiffened on their lingual surfaces with 20 karat solder, as advocated by Lourie for the portions of molar bands which have been burnished into grooves. This precaution is a good one, as it prevents the band, after being cemented, from pulling away from the concave lingual surface; this stiffness of the band also facilitates its correct placing upon the tooth when cementing. In the construction of bands, where tubes are to be used on their labial or buccal surface, they must not be pinched on this surface, but a lap joint does not interfere with the placing of the



Fig. 2.—Shows labial and occlusal views of casts of a girl twelve and one-half years of age. Also illustrates cast made recently from labial impression showing appliances. This case is nearing completion after two and one-half years' treatment.

half-round tube. The tubes for all but the molars should be the smallest obtainable, and, as suggested to me by Dr. Hawley, be .08" long. I have not been able to obtain tubes and wire for this purpose as small as I would like, for a very delicate pin will do the work required just as well as a larger one, and the arch will be just that much more resilient. When all bands are completed as above outlined, they are polished and cemented to place. The construction of the arch should not be commenced until a subsequent appointment.

CONSTRUCTION OF THE ARCH

The amount of the arch wire is ascertained by the assistant as suggested by Dr. Angle. The end of a piece of heavy ligature wire is placed at the buccal groove of the first molar and is burnished to the buccal and labial surface of all the teeth until the same position on the opposite molar is reached. To this length of wire is added about two inches; the ligature wire is straightened out and an equal length of the arch wire is marked off. The extra two inches of arch wire is to allow material for the Angle Young locks for the first molars

or to extend to the second molars if necessary, and a little extra for safety. If for any reason loops are required in the arch, a sufficient amount of arch wire is provided. The arch wire is then cut off. The assistant now solders, with 20 karat solder, at right angles to the arch wire, within $\frac{5}{8}$ to $\frac{3}{4}$ of an inch from the right or left end (the writer prefers to commence at the right side) a piece of the larger half-round wire.

Care should be taken to have all pins soldered true on the arch buccolingually and with the wide diameter of the pin wire parallel with the arch wire. All pins should be soldered at right angles to the arch, regardless, as before mentioned, in connection with the placing of the tubes, of the angle of inclination of the teeth. The half-round wire is now cut off and the end filed flat so that the pin is just a shade shorter than the tube into which it is to fit on the first molar band. The decided angle at the end of the pin is now slightly rounded with a file to facilitate its entry into the tube. (This technic should be followed with all pins.) The arch is now ready for the operator.

An important detail in the construction of the arch is to have as nearly as can be judged the correct amount of arch material between each pin. If teeth are tight together the arch should be bent over the round or oval beak of the pliers right into the interproximal space as far as possible and then bent sharply back over the flat beak of the pliers, and again lingually over the oval or round beak to lie close to the tooth. If this will not give sufficient arch wire, then a slight loop may be made, just sufficient to allow the correct amount of arch material. If, on the other hand, the teeth are somewhat separated, the arch should be carried straight from one pin to the other. If, however, teeth which stand apart are rotated, this will not be possible. In adjustments of the arch later in treatment, where the arch has been carried close into the interproximal spaces, it is gradually straightened out sufficiently to relieve any crowding, and where the teeth stand apart the straight arch is gradually shortened by being bent into the interproximal spaces. If at any point in treatment the arch material has been fully straightened out to relieve crowding, and it is found there is still not sufficient arch material, as will occasionally be found in crowded lower incisors, the arch wire may be slightly stretched by being carefully pinched with Dr. Angle's wire stretching pliers. If too much arch wire is present to permit bringing any teeth together by bending it into the interproximal space a slight loop may be made. Teeth which stand some distance out of line, or at too extreme an angle, may sometimes be handled with the spring, as will be described later, or a loop may be used. The pins are so short (.08") that it is usually possible to place them all in the tubes except in very rare cases, even though some teeth may stand at quite extreme angles.

An infinitesimal amount of solder is used to attach the pins, and any excess which would prevent the pin from going right home in the tube should be removed with a very fine flat file, the operator using a watchmaker's glass if necessary while doing this filing, in order to prevent marring the pin. (For those wearing glasses one may be obtained with a coiled spring which hooks on to the lens.) In some instances, when constructing the arch, the bends in the latter may prevent using a file upon the pin, in which case a very fine mounted stone, driven by the dental engine, may be used for the purpose.

The technic for the use of the solder in attaching the pins is that suggested by Dr. Ketcham long ago of flowing the tiny piece of solder upon the gingival aspect of the arch wire at the point of the scratch previously made. The writer's technic is to make a nick with a sharp file on the lingual aspect of the arch, after its removal from the mouth, opposite the scratch; then the solder is slightly fused on the arch, and if too much solder or heat has not been applied the nick will still be visible. The advantage of having the nick on the lingual is that the flat side of the pin wire presents to the operator while soldering, which facilitates its correct placing on the arch.

The half-round wire for the first molar is now placed in the tube on that band and the fitting of the arch commenced. If the second molar is present, and is to have an attachment to the arch, it will have been previously banded, and the arch is bent to lie against the surface of the band on the first molar, bent into the interproximal space, and conformed to the surface of the second molar band, and made to lie in its correct position at the mouth of the tube on that



Fig. 3.—Shows appliance in mouth of a young lady seventeen years of age. This is a particularly difficult case, requiring many rotations and much root movement, which can be handled with this appliance, in the author's opinion, more successfully than with any other known appliance. Case has been under treatment for a year and a half.

tooth. The center of the tube is now marked on the arch with a lancet or fine file, the arch removed and the pin soldered. The arch is allowed to extend a little beyond this pin, lying close to the band. The arch is now replaced, allowing only the second molar pin to enter its tube and the first molar pin made to lie buccal to its tube. The relation of the arch and the first molar pin to the tube on that tooth is noted, the arch removed and any change which may be necessary to make the pin telescope the tube to its full depth and lie passive is made by bending and twisting the arch wire itself. The arch is now replaced in the same manner, and when found to be correct, as nearly as can be judged, the pin is withdrawn from the tube on the second molar and that for the first molar is inserted in its tube and the relation of the pin to the tube of the second molar noted. When found correct, withdraw the pin slightly from the first molar tube and insert both pins to their full depth into the tubes. The arch is again removed and bent to conform to the surface of the first molar band

mesial to the tube to the line of contact between this tooth and the second premolar, then bent back first buccally and then lingually and made to lie close to the surface of this tooth or its band, if it has one. The detail governing the amount of arch wire between the pins as described above, must be followed. The position for the next pin is marked as before stated, the arch removed and the pin soldered. The arch is now replaced again with the pins in both molar tubes and the relation of the last attached pin noted. The arch is again removed and any changes necessary made, then replaced as before. When the arch is found correct, it is withdrawn from the molar tubes and the premolar pin only inserted. The relation of the pins to the molar tubes is now noted, and when all is correct, the pins are placed in all three tubes. After each pin is attached and placed in its tube, the line of contact of this tooth with the next one to be fitted may be marked on the arch by means of a scratch, thus locating definitely the point at which the arch must be turned sharply back to the buccal. Steps up or down in the arch may be required at certain points indicated by the positions occupied by the individual teeth. It is not necessary to place all pins in the tubes each time the arch is replaced, but the arch may be slightly bent buccally distal to any pin and only about two or more pins placed while conforming the arch to the other teeth. This detail of fitting and attaching the pin is carried out until the molars of the opposite side are reached, fitting forward and back alternately.

Now after careful adjustment, inserting first the pins in the tubes on one side and noting the relation of the arch to the remainder of the teeth, making any adjustments necessary, then inserting the pins of the opposite side and doing likewise, then those in the incisal region are placed and the position of the arch noted at both buccal ends and any necessary corrections made. The arch will have to be bent buccally in placing during this procedure to prevent "binding" which would interfere with the passive resting of the arch. When the arch seems to lie perfectly after this final truing up, the bends formerly made to facilitate placing of certain pins in their tubes without inserting all pins are now straightened out and the arch placed as nearly as possible with the pins alongside their respective tubes to check up the width of the arch. All pins are now placed in their tubes. When found correct, the arch should be removed and any locks necessary placed, the arch carefully adjusted again to detect any change due to soldering the locks, the appliance cleaned and inserted, to remain for a week or ten days without action.

Where no movement of the second molars is required the end of the arch wire is bent around to lie gingival to the tube on the first molar to form the Angle-Young lock.

I have been using the free hand method of holding the pin material while soldering to the arch, but I feel that the spring soldering tweezers designed by Pullen for holding the arch and round pins while soldering could be modified to hold the half-round pin material, without cutting the latter until after soldering.

Two or three pairs of pliers will be found to cover all requirements of the work of bending the arch, viz., the Young pliers, designed especially for manipulation of the pin and tube arch, a pair of flat-nosed pliers with as narrow a beak as it is possible to obtain them, and a pair with one flat beak and one oval or

round beak, such as those made by the S. S. White Company, Nos. 118 and 189. A bend is often desired immediately alongside a pin, either on the verticle or horizontal plane. This can be obtained by grasping the arch wire with a pair of flat-nosed or No. 118 pliers right at the attachment of the pin, and with another pair of the same pliers, or a pair of Young pliers, grasp the arch close up to the pin and give the necessary bend. If torsion is required, two pairs of Young pliers may be used on the arch wire as described by Young in his paper referred to at the beginning, or by one pair of these and a flat-nosed pair, the latter grasping the wire right over the pin, as above described, and the Young pliers holding the arch as far distant as desirable. The arch should be kept annealed as perfectly as possible during the whole operation of adjustment.



Fig. 4.



Fig. 5.

Figs. 4 and 5.—Illustrating labial and occlusal views of casts of a case of a little girl under nine years of age, with extremely narrow arches. The pin appliance was used upon this case in the later stages of treatment only. A little more work is necessary upon incoming cuspids and second molars.

MATERIAL AND SIZE OF WIRE

The material of which this arch is made is the well known "E" wire. The size I use mostly is .028, but in many cases recently, where the patient is very young or where there is very little expansion of the dental arch required, but requiring probably a good many rotations and the angle of inclination changed in many teeth, I have been using .025. I believe the .022, as used by Drs. Robinson, Suggett and others in this and other types of appliance, will be heavy enough in some cases, particularly where the teeth to which attachment is made are close together.

It is desirable that the pin material be made of the same metal as the arch, or something very similar. The pins are so short that spring is not necessary, but should be hard enough to prevent twisting or bending. The active force to obtain all movements is supplied by the arch.

It might be stated here that the tubes and pin wire obtainable at the present time for the teeth other than the molars is much too large. A very delicate and much smaller pin would be preferable. At the present time the pin material supplied is not straight, and it would facilitate matters if it were. It is also twisted upon itself, which is a great disadvantage. The pin wire and tubes are not always uniform in size; this causes a great deal of inconvenience and should be remedied.

Before the adjustment of the arch is commenced a diagram of its shape is drawn by the assistant. The detail of this is as follows: A straight line is drawn upon a piece of paper, and the distal of the molar half-round pins, if they are symmetrical, are placed at this line. Now with a very sharp pencil trace the inner line of the arch on the paper. The arch must not be touched to steady it, in any way, as it might thus be somewhat distorted. If the pencil accidentally touches the arch and moves it, the arch must be replaced in position. If the most distal pins are not fitted to diametrically opposite teeth then two straight lines should be drawn on the paper, one for each molar pin, so that the draft or sketch will be symmetrical or balanced on the paper. This sketch will act as a guide in "checking up" after making changes, and while not accurate, it is, nevertheless, of considerable assistance. It is desirable to keep at least the original sketch, marking it "original" and putting on the date. I might say here that the same principle is applied by me in the use of the removable lingual arch of Mershon.

ADJUSTMENT OF THE ARCH

The detail of the adjustment of the arch in treatment is very similar to that of its original construction, added to which, of course, will be the consideration of anchorage and resistance. The principle of reciprocal anchorage, as in all other appliances, should be utilized to the fullest extent. As described by Dr. Young in his paper, too much work must not be attempted at any one time, but the resistance of the teeth utilized from time to time as anchorage must be carefully studied, so that undesirable movements will not take place. If more expansion is required on one side of the dental arch than on the other, then some of the pins eventually required for the side requiring the greater amount of movement must not be attached at the beginning, but the teeth of that side carried out one or possibly two at a time, after the same principles applying to all other forms of appliance. Occasionally it may be found that certain teeth on the side requiring most movement buccally only require "tipping," in which case the work is facilitated; or occasionally it may seem advisable to "tip" certain teeth and straighten them up later with a pin. The requirements of each individual case will, with our knowledge of this and other appliances, suggest the procedure.

The technic of carrying teeth laterally along the line of the arch was carefully described by Dr. Young in his paper referred to earlier. This consisted of carrying one tooth at a time, using all the other teeth as anchorage. Often teeth,

particularly lower incisors, lean to one or the other side and require only their crowns "tipped." In this case, after obtaining the necessary expansion and space, the pin is removed from the tooth first to be tipped, and either a silk ligature applied or a spring of .022 wire attached to the arch and made to rest against the approximal surface of the tooth to be moved, or the end of the spring may be turned at right angles and made to drop into the tube on the band, the arch being adjusted to rest away from the end of that tube sufficiently to permit of this. After the tooth is tipped to place, the pin is replaced and the same procedure carried out with the rest of the teeth to be so moved. Where a tooth is overerupted, it can very nicely be depressed by a spring attached in like manner, or one occupying a position some distance away from the line of the arch can be moved into position by means of the same principle. A half-round pin is soldered to this light spring if it is desired to carry the tooth bodily and perhaps rotate it at the same time.

When decided rotation of upper premolars is required, a spur is soldered on the lingual surface of the band for the use of a ligature in the regular way, and the pin for this tooth is not put on the arch until the tooth has first been rotated, when the pin is attached. All other teeth, except possibly in very ex-



Fig. 6.—Illustrates lower cast of a case of a little girl twelve and a half years of age, in which the arch is slightly contracted and every tooth rotated. The bands were fitted in the mouth and transferred to impression, from which the model was made. The arch, which was made of .022 wire, was constructed on the model. This appliance was made for the clinic. In practice the arch should always be constructed upon the natural teeth.

treme cases, are rotated by the arch proper by means of the half-round pin, or by the spring as before mentioned. The one great advantage of the half-round pin over the round one is to obtain these rotations, of which there are many. The pin itself is not bent for any purpose whatsoever, the whole action being obtained by the manipulation of the arch wire. Upper canines, which so often, in Class I cases (or, in the terminology of this society, neutroclusion) are found to occupy a position of buccal occlusion and leaning toward the median line, can best be "tipped" to place by means of a spring of the .022 wire attached distal to the canine. It is often not necessary to band these teeth at all.

It is frequently necessary to carry the apices of lower canines buccally. To accomplish this it is wise to utilize all the other teeth as anchorage. Any teeth requiring tipping of their crowns are carried to place either with a spring or a ligature. In the case of molars, to which it is necessary to have the arch attached, requiring their crowns tipped, this may be accomplished in different ways. A very desirable plan is to slip over the distal end of the arch wire a round tube which just fits, to which tube has previously been soldered the half-round wire for attachment to the molar. If the bite is too close to permit of this, the arch may be cut anterior to the molar and the tube soldered to the

molar end of the arch wire and the anterior end allowed to telescope the tube far enough to be efficient. This latter idea I utilize considerably also with the removable lingual arch of Mershon, either on one or both sides, as indicated, and find it works beautifully.

The pin appliance is very efficient where incisors are to be depressed and premolars extruded, the arch being adjusted to rest a little occlusal of the tubes on the premolars and to press gingivally on the incisors. Locks must be placed to hold the arch snug in the tubes on the premolars. The writer has not evolved or yet seen a very neat form of lock for the pins other than on the molars, but is using so far just the Angle-Young principle. The pins may be left a little longer than the tube and a wire ligature used, but this wire should be of precious metal, as the brass ligature discolors the band decidedly.

Where all four incisors require to have their apices moved, they can usually be carried simultaneously if there are attachments to at least three of the buccal teeth on each side. With less anchorage, not more than two incisors should be moved at a time.

Many rotations can be carried on at the same time, giving to each tooth very little action at each sitting. The arch is bent close to the pin to give the rotation necessary and then counteracted immediately beyond the pin again.

Where considerable change is to be made in the arch, care must be taken to put action in one section at a time, keeping the balance of the arch as control, as suggested by Dr. Young. When changes are completed in one section, its relation can be noted and this portion used as control while another section is being changed. The last changes to be made at each sitting should be those to obtain apical movement.

Where the arch wire is twisted, as suggested by Dr. Young, to change the bucco-lingual (or labio-lingual) angle of any pins or pin, great care should be exercised in counteracting this twist distal to the point where action is desired, not to put too much power on any teeth. After twisting the arch it should be very carefully fitted, first one side of the changed area and then the other, as suggested earlier in the detail of construction of the arch.

It is not desirable to readjust this form of appliance more often than once a month, and, with a still lighter wire than the .028, more action can be put in as suggested by Robinson, and the changes made at much longer intervals.

I have found in the preparation of this paper that it is impossible to give every detail in so exacting a technic without making the paper much too long, and I must thank you for your kind indulgence during my presentation of the subject. I realize, too, that it has been compiled in a most rambling sort of way. Much of what I have said here is probably not new to any of you; a great deal, too, is not original, and if I have failed to give credit where it is due, it is because of my lack of knowledge of the literature.

In closing I would say that any operator who will exercise care and skill in the use of this appliance will obtain most gratifying results in the treatment of the most difficult cases.

It is my desire here, also, to extend my sincere gratitude to those men whose ideas I have copied. If there are errors in my technic, or improvements which may be suggested, I shall be glad, indeed, to have some mention of them in the discussion.

DISCUSSION

Dr. Adelburt Fernald, Boston, Mass.—I have been very much interested in this paper, and especially in the beautiful results the essayist has shown us. I have used the pin and tube appliance very little, not enough to discuss the subject intelligently, but I think if any one can produce the results that the essayist has shown us, it proves that he is a master of that method.

I would like to ask the essayist to tell us how long it takes him to treat one of these cases. For instance, the first case. The time he began until the time when it was finished.

A number of years ago I experimented with a square tube; I got results that seemed satisfactory in my hands, but still the results were not quick enough by that method. The patients would go away and when they returned the appliance would be bent out of shape or dismounted. Perhaps the fault was in my technic in not making the right models. The pin would break off and I would lose what I had gained. I gave the method up and took up other methods that in my hands were more efficient, and I got results much quicker than with this method. As I have said, it may have been due to my faulty technic and not to the materials that I used.

Dr. C. A. Kennedy, Toronto, Ontario, Canada.—I have not used this pin and tube appliance enough to comment on it. I have seen some of the results that Dr. Grieve has obtained from it and they are admirable. He accomplishes by this method features that seem almost impossible with other methods.

The technic Dr. Grieve uses is very exacting. I do not think myself I would have the patience to go at it in the way that he does.

One great difference which he does with his method is that he makes his labial arch to correspond to the malocclusion. Then he straightens out his arch wire to the form of a correct occlusion, so when his labial arch is straightened out, his teeth should be in proper alignment.

Dr. Sydney W. Bradley, Ottawa, Ontario, Canada.—I think I am perhaps mostly responsible for Dr. Grieve giving us this valuable paper. I wanted to give all of you the opportunity that I have had to see some of Dr. Grieve's work. I have seen some of his admirable work and during the past two years I have been trying to use the half-round pin and tube appliance and find that I am getting better results. The technic is very exacting, but it is worth while. I use it more for finishing up cases, using silk ligatures to bring the teeth into fairly good alignment, then using the half-round pin and tube to finish the case, I put the half-round tubes on the bands at first even if I may not use them for months afterwards. I believe with this appliance we have better control over the individual tooth than perhaps with any other appliance. I hope I shall have the patience to master the technic as Dr. Grieve has done.

I would like to ask Dr. Grieve if it is elastic wire he uses for the arch.

Dr. Grieve.—It is E wire.

Dr. Bradley.—This morning, when Dr. Johnson was reading his paper and advocating the use of heavy bands to prevent the occlusion from bending the edges I remembered a point which Dr. Grieve gave me and which I forgot to bring up at that time. It is to flow solder in the lingual and buccal grooves of your molar bands. This will strengthen the band greatly on the occlusal edge.

Dr. D. S. Sterrett, Erie, Pa.—In the application of force in the use of pins as described by the essayist, apparently the attachments will move teeth if the appliance attached to the teeth to be moved is quite accurate and fixed and very easily corrects any maladjustment toward the anchored teeth.

It was further brought out by the essayist that where any number of teeth are to be moved the pins for these teeth should be put on one at a time and a number of teeth pitted against them. I wonder whether it would be feasible to reenforce the anchorage or stability of the molar teeth by some application of the soldered lingual wire as was described yesterday.

A further question occurs in seeing the slide representing this appliance on both upper and lower teeth at the same time. It is my impression that this appliance offers a gentle resistance. It has been my observation that the pressure exerted by mastication is not a gentle force, but a rather severe force. It must be considered in its effect upon the lower teeth. I wondered how much it was safeguarded, how the arch of the lower teeth is safeguarded against a severe cross action of the upper teeth?

Dr. W. W. Woodbury, Halifax, Nova Scotia.—I had great pleasure in seeing practically the way in which this appliance works when in Toronto recently.

There is one thing I would like to point out, and that is, the *short* pin and *short* tube. We were taught first to put these tubes on the individual anterior teeth parallel, and the pins were slipped up paralleled. The short pin allows the essayist to put the tubes on the anterior teeth so that each one is parallel to the axis of the tooth. You are thus working toward the normal with the appliance, as well as toward the normal occlusion. In the old way, when you start the pins parallel, as the teeth come into occlusion the pins get further away from being parallel to each other. In this case, when you finish your pins are all parallel, and in that way it seems to me, it is easier to manipulate the appliance.

The essayist showed the importance of carefully placing the bands so that the tubes are all about the same distance from the incisal edge. Thus the wire is finally straightened out as the correct occlusion is finally brought about. These are points that interested me very much.

Dr. Addison E. Kingsbury, Columbus, Ohio.—I have never used the half-round pins, although I have used the ordinary pin and tube appliance a great deal, as Dr. Young demonstrated here in Chicago, and I must say some of the best results I have obtained I have secured with the pin and tube appliance. I can see how the half-round pins would be a great help in taking care of the rotation of a tooth, and I shall be glad to try them. I think the pin and tube appliance, when used intelligently, is by far the most efficient appliance that we have. I feel as Dr. Young expressed himself in regard to it—I never had the feeling of getting away from tinkering orthodontia as when I got to using the pin and tube appliance.

Lately, I have been using it in a way which I think may be of some help to one who wants to take it up again. I use .030 wire that Dr. Angle suggested in the tube and pins which I got from White's original idea, but in a great many cases, uncomplicated cases, which Dr. Grieve showed at first, I have been in the habit of putting on .031 wire with the plain bands and loops in front of the molars, and having the bands on the incisor teeth but not cementing them at first. I would use temporarily and ordinarily the Magill band and spur and do a great deal of expansion and rotation, proving up the bands before I put on the nut. It seems to me, where you adjust an appliance once a month, in a year's time it is quite possible you would not in a complicated case have much progress to show for your time. Your patient might be discouraged, or you might be discouraged yourself. By doing this preliminary work and using the appliance more as a contouring and retention apparatus, it is certainly a very valuable appliance.

In my opinion one of the greatest advantages of the pin and tube appliance is that you have almost absolute control of anchorage. In a Class II case, where it is desirable that most of your readjustment should be made, by moving the lower teeth or the lower arch, or even the mandible forward, you have in this pin and tube appliance on the upper absolute anchorage, and I am using it now in connection with lingual arches on the lower, and although the technic requires care, I find this appliance so valuable that I would be loath to give it up.

Dr. Grieve, (closing the discussion.)—Dr. Fernald, in his discussion, spoke of the length of time it takes to treat cases with this appliance. You can get results as quickly with this appliance as with any other. You have absolute control of the teeth and can move them as rapidly as you desire, the fixed attachment to the teeth, particularly where there are many rotations necessary, being much better than ligatures.

I have quite a number of arches in use made of .025 wire, but have so far only used one made of .022 wire. The majority, however, in my practice, are made of the .028 wire.

Dr. Fernald referred to a case, a slide of which was shown on the screen. That case was handled nicely in a year. A slide was shown of a very decided case, the teeth of which are getting pretty well in position at the end of two years' treatment: also another, showing a little labial impression above the ordinary pair of models, which has been under treatment for two years, and the teeth are getting pretty nearly into normal relation.

Dr. Sterrett in discussing the appliance, if I understood him correctly, voiced the opinion of a great many men, and, if I remember his point, it was this: An appliance, such as the pin and tube, is too rigid; it does not permit of the individual movement of the teeth which it is desirable to have. I appreciate, as much as any of you, the importance of permitting the forces of occlusion to operate unhampered by the appliance, but there are cases in which the angle of inclination of many of the roots is such that the forces of occlusion will never succeed in placing them at their normal angle of inclination. You must have something in the way of a fixed appliance in these cases. I prefer to use a lingual arch, as Mershon recommends, in preference to any other appliance, where it will do the work, but there are, in my opinion, many cases where it will not do the work.

Major Eby spoke of the Jackson appliance. I do not use it, but I can see its advantages in some cases, if skillfully adjusted, but I feel that it must be more or less difficult to keep the appliance from impinging upon the soft tissues. He spoke also of Dr. Angle's ribbon arch allowing the teeth more play, and thus superseding the pin and tube appliance. I think Dr. Angle's ribbon arch will neither supersede nor be the equal of his pin and tube appliance in efficiency. I used the ribbon arch in only a dozen cases, and was able to get most of the movements I desired, but could not get a lateral "tipping" of roots. It seemed to me that the sides of the bracket sloped so that the little U cleat, soldered to the arch, did not grasp the bracket sufficiently firmly to permit of "tipping" the root, although the teeth could be moved bodily in a lateral direction. With the ribbon arch, if you have attachment to the first molar, you cannot get attachment to the second premolar, which often requires some root movement as well as rotation. It may have been due to my lack of skill, but I found the technic of the ribbon arch, when used upon cases requiring a multiplicity of movements, much more difficult than the pin and tube appliance and not nearly so efficient as the latter when used with a half-round pin.

To gauge the amount of twist given the ribbon arch, some one suggested little extensions of wire, one with a slot to grasp the arch, and another with a flat end to place in the bracket. With the aid of these extensions one could see the amount of twist given the arch. That no doubt would be an advantage, but I have never used it.

I believe that the pin and tube appliance, when used with the half-round pin and the Angle-Young attachments to the molars, in difficult cases where much root movement must be made, has no peer today.

One of the speakers referred to the application of force and the reinforcement of the anchorage by the addition of the lingual arch. The reinforcement of molar anchorage with the lingual arch, as suggested by Dr. Dewey, is an excellent idea, if there is a tendency for displacement of the anchorage, and I have utilized it in some cases. I do not use a fixed (or soldered) lingual arch as advocated by Dr. Lourie.

Some gentleman spoke of the force of the appliance and asked if it would not be antagonized by the greater forces of occlusion. We know the normal stress of occlusion is a very important factor, and the absence of the normal function of mastication accounts for the large number of cases of malocclusion. We all realize that if from the time the deciduous denture was nearly complete children were trained to masticate thoroughly, there would be a much smaller percentage of malocclusion, and not so much stomach trouble and intestinal derangement.

Using a delicate pin appliance, with the .022 wire, in a case such as that which will be shown in the clinic, where the attachments are close together, it seems to me that it would be impossible to obtain such efficiency with any other form of appliance, and the forces of occlusion will not combat the force of the appliance if the latter is intelligently adjusted. You must adjust any appliance in such a way that it will work in harmony with the natural forces of occlusion.

Dr. Woodbury emphasized the importance of having the pins attached at right angles to the arch and the tubes placed parallel with the long axes of the teeth. With this technic, when the construction of the arch is completed, the pins may stand at varying angles to each other, but when adjustment of the arch is commenced, you gradually work all the time, not only toward the normal shape of the dental arch, but also toward the bringing of the pins parallel to each other. In other words, in the adjustment of the arch, you are working always toward the normal in every respect. The more exact the technic, the more pleasure you will have in working with the appliance, and the more perfect will be the result.

Dr. Woodbury said this is the most efficient appliance we have. I believe there can be no doubt about that. I have used the pin and tube appliance ever since its first introduction by Dr. Angle in 1910.

Dr. Kingsbury said he would start these cases without any pins on the arch except those for the molars, and would use ligatures on all other teeth and place his pins later. In my experience, ligatures are not nearly so efficient as the half-round pins, even for rotations, except in those instances which I mentioned in my paper, where rotation of the upper premolars is required. These teeth often require the lingual cusps carried either mesially or distally, and this can best be accomplished by means of ligatures. If a premolar must be carried distally, the ligature may be attached to a spur on the molar and not to the arch. If the tooth requires to be carried buccally also, another ligature may be attached to the arch, and when you get the tooth or teeth rotated a pin should be placed on the arch to hold it.

Dr. Kingsbury spoke of using the pin and tube appliance on the uppers where you require good stable anchorage to carry the lower teeth forward. There are not many cases where the lower teeth have to be carried forward in the mandible. In most cases where there is a distal occlusion of the lowers it is the mandible which is at fault. Where the teeth do occupy a distal position in the mandible it is usually necessary to carry them forward bodily in an upright position, and even carry the apices of the incisors more than the crowns. Mershon says that with the lingual arch, placed low down, with slow movement you have the teeth carried forward in the upright position through the effects of normal function of the lips. There is no doubt that is true to a certain extent, but where a great deal of root movement is required I prefer an appliance which will act independently of lip function, for these patients are usually mouth breathers and lack that normal lip function which is so indispensable if a lingual arch is used.

Dr. Lourie's idea of a high (or low) labial arch with light springs extending to nearly the incisal ends of the teeth embodies the same principle. This arch will accomplish what is wanted in the hands of Dr. Lourie, or in the hands of expert technicians who have had a great deal of experience with that form of appliance. It is ideal, but I think it requires more skill to handle a case with the springs, where you require rotations and root movement, than with the pin and tube. It is not so difficult to get labial movement of the apices with the springs as it is to obtain lateral tipping.

I know the fixed appliance has its disadvantages in that it does not allow the freedom of the teeth which they might otherwise have, but if great care is used in the application of the force, and good judgment in adjustments, I believe there will be very little undesirable effect upon the soft tissues and underlying bone from the use of the pin and tube appliance.

It was asked whether I use this appliance as a retainer or adjust some other form. In some cases, particularly on the upper, I remove the pin appliance within a very few months after all teeth are in position, and do not put on any other, except that I might place an odd band with spurs to hold teeth which had been rotated. On the lower arch I would take off the pin and tube appliance and adjust a removable lingual arch as a retaining appliance, allowing the normal action of the lips and cheeks to close any slight spacing which might exist. By using thin banding material you will have very few spaces when you get through if you are careful in your treatment.

Lastly, the pin and tube appliance, if properly placed, is a cleaner and safer appliance to use, from an hygienic standpoint, than any other fixed appliance.

HISTORY OF ORTHODONTIA

(Continued from page 368.)

BY BERNHARD WOLF WEINBERGER, D.D.S., NEW YORK CITY

CLARK L. GODDARD, A.M., D.D.S., (1849-1905). *Goddard* spent considerable time studying odontology and succeeded in gathering together a large variety of skulls and teeth. He was particularly interested in the study of the cingulum and cusps of human teeth, with a view as to their evolution.

His first paper on irregularities of the teeth was read at the Ninth International Medical Congress, Washington, in 1887. Before the World's Columbian Dental Congress, 1893, he brought up the question of *Separation of the Superior*



Fig. 1.—Clark L. Goddard (1849-1905).

Maxilla at the Symphysis. In this paper *Goddard* explained his method of accomplishing this task by using a combination of appliances, first using the jack-screw. He had found that only two cases of forcible separation of the maxillæ at the median line had been reported, one by *W. B. Kingsbury* and the other by *E. C. Angle*.

"In *Dr. Farrar's* book the possibility of such a separation is mentioned, also the fact that it sometimes happens, and plans are given for preventing such an

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occurrence (p. 182). No pain or discomfort accompanied or followed the case *Goddard* described. He kept the arch spread, thinking that a deposit of osseous material in the suture would help to retain the extra width of arch that he had gained and give the room needed for correcting the irregularity of the incisors. The centrals were rotated and the laterals drawn forward till they assumed their proper positions.

"To correct the irregularity an appliance was inserted with a jackscrew for spreading the arch. The nut of the screw was turned twice daily and the arch spread without pain till in about three weeks the teeth presented the appearance shown in the model.

"By measuring from the buccal surfaces of the first bicuspid it is seen that the arch is spread exactly one quarter of an inch. You will notice that the appliance is attached to the first bicuspid and the first molar on each side, but does not come in contact with any of the six anterior teeth. Now comes the surprising part, that the spreading is not confined to those teeth only to which the appliance

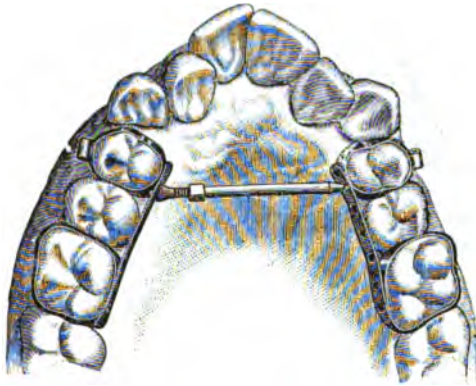


Fig. 2.

is attached, for the central incisors which previously overlapped are now separated by a decided space. Upon making accurate measurements we find that the cuspids have spread apart $\frac{3}{32}$ of an inch, and that the centrals, measuring from distal to distal surfaces have separated at least one-sixteenth of an inch. How can this be accounted for since the appliance did not touch any teeth anterior to the bicuspid? I can only account for it by the supposition that the two halves of the superior maxilla have separated in the median line. If the casts be examined a depression will be plainly seen in the gum above the space between the central incisors, while there is no depression in the corresponding position in the first cast.

"I have quoted thus freely on account of an opinion often expressed and formerly firmly believed by myself that a separation would be much more likely to take place in the line of the suture between the intermaxillary bone and the superior maxilla of either side. The fact that congenital fissure of the hard palate extends from the soft palate in the median line as far as the intermaxillary bone, then deviates to the right or left or follows both directions in the line of the suture between the intermaxillary and superior maxillary bones would lead us to expect any separation of the superior maxillæ in the same lines.

"Appliances for Spreading the Arch.—The combination which I used for spreading the arch has worked so well in this and many other cases, that I think a description will not come amiss.

"You will notice that I call it a 'combination' and at first sight its general features will seem so familiar that you will say that it is nothing new. Its various parts are old, but the exact combination new. I use the *Magill* bands, with *Angle's* tubes soldered to the buccal surfaces of two of them. Instead of soldering a tube to the lingual surface of each band, and extending a wire through the two tubes as recommended by *Dr. Angle*, I solder a flat bar about an eighth of an inch wide or less, and thick as number 24 plate U. S. G. to the lingual surfaces of the bands on each side, thus uniting the band of the bicuspid to that of the molar, or the band of the cuspid to that of a second bicuspid. In this bar are punched holes at short intervals. In opposite holes, across the arch, are placed the ends of an *Angle* jackscrew, or a *Talbot* spring. I prefer the spring because it can be bent to lie almost in contact with the arch of the palate, and be out of the way



Fig. 3. (Goddard.)

of the tongue much more than the jackscrew. The spring or jackscrew can be placed in any position along the bar, whenever the force is needed, and will stay in place, not sliding forward or backward, the ends being retained in the holes. If necessary, two springs or two jackscrews can be used, one at each end of the bars, but I have found one to be sufficient. The bar is easily soldered to the bands as follows: Fit the bands on the teeth or on the cast, as preferred, melt a little solder on the lingual surface of each band, place the bands on the teeth of the cast, which is better for the purpose if made of equal parts of plaster or marble dust or sand, although plaster alone will answer the purpose. Having fitted the bar and punched the holes in it with a plate punch, tip the cast so the bar will lie in place and apply the blowpipe flame. The bar, being free, will be heated first, and the solder already on the bands will easily unite with it, without heating the whole cast to a high heat.

"If it is desired to move four teeth on each side; viz., two cuspids, bicuspids and molar, the bands may be placed on the cuspid and second bicuspid on each side and the bar extended beyond the second bicuspid along the molar, or the bands may be placed on the first bicuspid and molar on each side and the bar extended forward around the cuspid, in which case the end of the bar should be made narrower and extend slightly between the cuspid and the lateral incisor.

If it merely rests on the inclined surface of the cuspid as force is applied, it may move along this inclined plane and force the bicuspid slightly out of their sockets, or the cuspid into its socket without moving it out as desired.

"After the arch has been spread a bowspring of wire can be placed around the anterior teeth and held in place by inserting the end in the tubes on the buccal surfaces of two bands (Fig. 3). This bowspring can be used for attaching rubber bands for drawing incisors forward or rotating them. To prevent the ends sliding too far through the tubes, a bayonet may be bent in each end of the bowspring, or the ends may be threaded and nuts put on to keep it in place. If the latter plan is followed, the size of the bowspring may be increased or diminished by moving the bowspring backward or forward. If it is desired to move several incisors forward at once, the bow may be ligated firmly to these teeth and moved forward by turning the nuts at the ends. If the case is a V-shaped arch, the prominence may be reduced by first spreading the arch, then inserting the bowspring, putting the nuts behind the tubes. By turning these nuts the bow may be drawn back and thus move the incisors with it.

"The arch may be retained after spreading by substituting a V-shaped wire for the Talbot spring, or if the bowspring be used outside it may be stiff enough to keep the arch spread.

"An inner bow may be used to advantage for keeping the arch spread and reducing V-shaped or prominent incisors, by extending rubber bands from it to the offending teeth. This appliance may be made of German silver, but I prefer platinum for the bands, clasp gold for the bar and bowspring and gold plate for the tube.

"Movement of the Teeth.—There is a question which needs our attention and which I would very much like to hear discussed, that is: What changes take place in the surrounding tissues when teeth are moved? The common answer is: 'Absorption of tissues in front of the moving teeth and building up behind.' This answer has not fully satisfied me, for in many cases where several teeth are moved at once and in the same direction, I have observed a movement of the alveolar process itself. I noticed this first in 1883, and have taught it to my class ever since. I saw no notice of it in print before that time, and have seen it mentioned but twice since.

"In the first volume of *Dr. Farrar's* book on irregularities, page 142, he speaks of this movement as a 'bending of the alveolar tissue.' The term is a good one, and I am surprised that such a bending or movement is not more widely recognized. It was first brought to my attention in a case in which I was retracting incisors by means of rubber bands attached to a plate in the roof of the mouth, which plate was clasped to the molars. After a few weeks, as the incisors moved in, I noticed that the plate did not fit the roof of the mouth as before, and upon examination found the palatine portion of the alveolar ridge, posterior to the incisors, much fuller than before, so much so as to prevent the plate going back to its former position.

"I have noticed the same bending of the ridges when the four (4) incisors were moved outward, and in cases of spreading the arch, yet I have never known or heard of such a result. The outer plate of the process at least must move with the teeth. We might in that case expect to find the ridge much thicker after the

teeth are moved, from filling up the sockets behind the teeth, but such is rarely the case. When the arch is spread there is more room in the roof of the mouth. The whole ridge has moved or been bent on its base as if the process were semi-plastic. When prominent incisors are reduced, if the ridge did not bend we would expect the teeth to move without removing the prominence of the labial portion of the gums and ridge, we would expect the ridge to remain prominent till sufficient absorption had taken place to reduce it to a normal thickness. Yet as the incisors are moved, you will find the gums and ridge over their roots no thicker at one time than at another, and when the teeth have reached their new location the outer plate of the process will be found to have arrived at the same time.

"When single teeth are moved along the ridge or outward or inward, there is without doubt an absorption in front and building up behind, as well as a compression of the cells of the process, but when several teeth are moved in one direction I have no doubt that there is, as *Dr. Farrar* expressed it a 'bending of the alveolar tissue.'

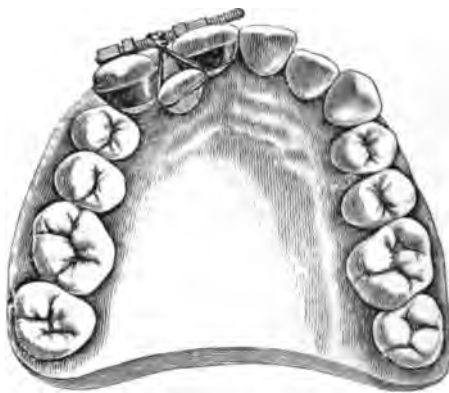


Fig. 4. (Angle.)

"*Making Room for an Inlocked Incisor.*—I have found an easy and simple way of making room and moving forward an incisor. A few years ago *Dr. Matteson* gave a method, as illustrated in the *Dental Cosmos*, by placing a spring in front of the overlapping teeth and attaching a thread or narrow platinum band to the two (2) ends of the spring in such a manner that it passed the teeth on which the spring rested and behind the inlocked tooth. By the tension of the spring this thread or thin band, tending to straighten, would push apart the overlapping teeth and move forward the inlocked ones. While the appliance seemed simple and very efficient in theory, I found in practice that it did not work so well. The thread or band would slip up or down and infringe on the gum, or slide off the cutting edge of the tooth. It was difficult to keep it in place. Even when it kept in place it would spread the overlapping teeth too far apart before the inlocked tooth could move forward in position. I found the same trouble with *Dr. Farrar's* appliance, in which a similar platinum band was used, and the ends of it attached to a screw for straightening it.

"I was not wholly satisfied with this appliance because the teeth on one side tended to return when the straight wire was substituted for the spring.

I therefore substituted a cut wire for the spring, placing two (2) nuts on it. (See Fig. 4.) These nuts can be placed next the tubes on each side, and as they are turned will force the teeth apart, while a rubber band extended from the screw over the offending tooth will draw it forward (Fig. 4). This rubber band may well be applied as soon as lateral movement is begun with the overlapping teeth, that is, as soon as any room is gained. An additional advantage of this plan is that the rubber binds the teeth together, so as to prevent the side teeth from being crowded out of the line of the arch. If the irregularity mentioned is on one side only, the line between the centrals will not usually correspond to the median line of the face but by means of such an appliance as described, force is exerted so as to move the teeth towards the median line so that the two (2) will correspond.

"Instruction in Orthodontia.—The teaching of orthodontia in colleges has become of great importance in the last few years. It should be taught practically as well as didactically. I have found the following a good plan, and it is the gradual result of eleven (11) years teaching:



Fig. 5. (Goddard.)

"Instruction is begun in the junior year and continued through the senior year. The didactic instruction consists of lectures and quizzes illustrated by means of drawings, the blackboard and the lantern. By means of an opaque attachment casts and appliances can be projected on the screen as transparent slides. Cuts from books and journals can also be thrown on the screen by the same lantern. They are easily arranged and add very much to our means of illustration. Junior students are required to devote at least one hour a week to making appliances. Each student is required to provide files, pliers, draw plate, screw plate, etc. He is furnished with large German silver wire and heavy plate. He is required to draw the wire down to the various sizes needed and to roll the plate out to various numbers needed; to cut screw threads and wire, make nuts, taps, draw tubing, and construct various characteristic appliances, such as *Magill* bands, jack and drag screws, *Talbot* springs, appliances for rotating, retracting, spreading, etc. A list of these requirements is given to each student and he is required to work under the instruction of a competent demonstrator of orthodontia technic.

"The senior students are required to work practical cases, which the infirmary has provided in great numbers. A patient is assigned to each student,

or if there are not enough for that, one case is assigned to two (2) students who work together and each receives as much benefit as though he had a case alone. He is first required to take impressions for casts and to fill out the following blank:

UNIVERSITY OF CALIFORNIA—COLLEGE OF DENTISTRY
Orthodontia for Seniors

Name of Operator	No.
Name of Patient	189
Sex of Patient	Age
Nativity of Father	Nativity of Mother
Regularity of Father's teeth	
Regularity of Mother's teeth	
Habits. (A) Mouth Breathing	
(B) Thumb Sucking	
(C) Lip Sucking	
Enlarged tonsils	
Median line	
Occlusion, Normal, Prognathous, or Sup. Protrusion	
Mastication	
1. No. of teeth out of normal line	
2. No. of teeth within normal line	
3. No. of teeth rotated	
4. No. of teeth long or short	
V-Shaped arch	
Width of arch between first molars	inches
Height of Palate	High
	Medium
	Low
No. of teeth decayed	
Structure of teeth,	Hard
	Medium
	Soft
General description of case	
Drawing	
Treatment	
Result	

"Clinical lectures are then delivered over these cases. The patient is seated in an operating chair near a blackboard. The student, or students, in charge have the blank and cast ready for inspection. While the class is examining the patient, a drawing is made on the board representing the irregularity. The case is then described and attention called to its peculiarities, and the treatment prescribed. The proposed appliance is drawn on the board with colored chalk, and its action explained.

"The student is instructed to make such appliance, and bring the patient to the next clinic, with the appliance in position. Having already made appliances in his junior year he is competent to make whatever is prescribed. These clinics are held once a week, and several patients can be examined at each. The students are required to present the patient at these clinics at frequent intervals, so that progress may be noted, mistakes prevented or corrected, etc.

"For similar cases different appliances are prescribed, in order that the efficiency may be tested, and the students thus have an opportunity of serving their workings. Thus, the screw is used in one case for spreading the arch, and the spring in another. On one side of the mouth a drag screw is used for retracting the cuspid and on the other elastic bands, etc., etc.

"When a case is complete, retaining appliances are inserted, and the patient instructed to be present at intervals for inspection.

"Casts are required of each case, showing the beginning and end of the case, and any instructive intermediate stages. These casts, with the regulating appliances in position, are stored in the museum, for reference and future use in illustrating lectures and clinics.

"These clinics have proved very interesting and instructive to all concerned, and the students have, as a rule, eagerly availed themselves of the opportunities presented, often bringing patients for the purpose. When cleft palate cases can be obtained they are shown at the clinic and appliances constructed for their relief.



Fig. 6.



Fig. 7. (Goddard.)

In the *Items of Interest*, 1897, page 119, Goddard states the following propositions:

"*Proposition 1.*—If the deformity is due principally to the lower jaw, I would first try to jump the bite and force the lower jaw forward with a plate in the upper arch, having an inclined plane posterior to the superior incisors on which the inferior incisors could occlude, as shown by *Dr. Kingsley* in *Oral Deformities*.

"The superior incisors could be drawn slightly backward then, by rubber bands attached to the plate.

"A more effective appliance would consist of metal crowns for the superior molars with lugs projecting down behind the inferior molars, so that the teeth could not be occluded without throwing the lower jaw forward.

"To the buccal surfaces of these crowns I would solder tubes for the in-

section of the screw cut ends of a labial bow, the anterior part of which would rest in notches cut in bands cemented to the superior central incisors. By means of nuts behind the tubes, force could be brought on the superior incisors to reduce slightly their protrusion, and close the space between the centrals. This bow should be of stiff gold wire, and wider than the arch, so that the superior bicuspid could be moved buccally by means of rubber bands or ligatures. The bow would bind the superior teeth together so that the strain put on the lugs in jumping the bite would be borne by all the teeth instead of by the molars alone.

"Proposition 2.—If the profile of the face indicated that the deformity could be corrected by operating upon the superior arch alone, I would extract the superior first bicuspid and cement on the first molars broad bands with buccal

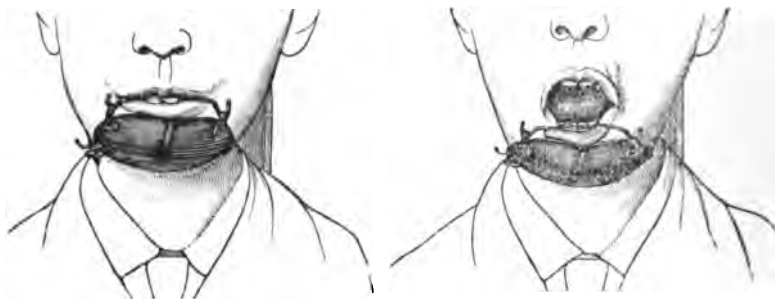


Fig. 8.—Depressing lower incisors. (Goddard.)

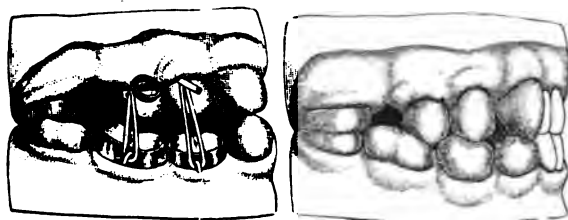


Fig. 9.

Fig. 10.

tubes, in which I would insert a labial bow, as described above, and shown in Fig. 5.

"Behind these tubes I would apply nuts for tightening the bow. These would be merely for retention, as, in the majority of such cases, the first molar and second bicuspid on each side—four teeth only—would not afford sufficient anchorage for moving the six anterior teeth.

"For moving the anterior teeth, and thus reducing the protrusions, I would use the cap and bit shown in Figs. 6 and 7. The vulcanite bit should be made on a cast formed in an impression taken with the bow in place, so as to fit over it, and should not be allowed to project between the central incisors. The cap and bit could be worn at night only, or at such times as the patient is not at school or at meals. The nuts on the end of the bow should be tightened every morning just enough to take up the slack caused by the movement of the anterior teeth during the night. The rubber cord from the cap to the bit should be so applied as to draw upward as well as backward and force the superior teeth somewhat

into their sockets (see Kingsley, p. 134, Fig. 66). This is to prevent the inferior incisors impinging on the lingual surface of the superior as they move back. If reduction of the length of the superior incisor is not desirable, the inferior might perhaps be forced into their sockets by a bit and chin piece as shown in Fig. 8, or the bit might be opened by means of gold crowns on the inferior molars; the bicuspid could then be forcibly erupted by rubber bands extending to the superior teeth as shown in Figs. 9 and 10."

In the *American Text Book of Operative Dentistry*, first edition 1897, Dr. Goddard wrote the chapter on *Orthodontia Exclusively as an Operative Procedure*. He states:

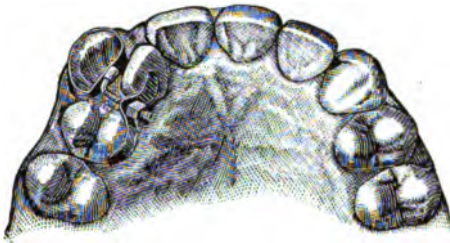


Fig. 11.



Fig. 12.



Fig. 13.

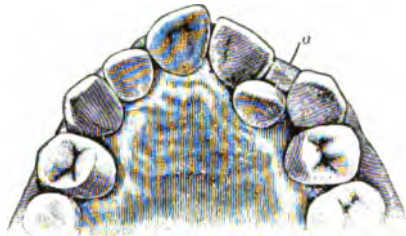


Fig. 14.



Fig. 15.

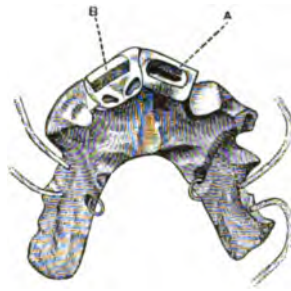


Fig. 16.

"*The Normal Arch*.—As the study of physiology is necessary before the study of pathology, so is a study of the normal arrangement of the teeth necessary before the treatment of their irregularities should be undertaken.

"The face from the hair to the chin measures three-fourths of the whole height of the head. The forehead to the root of the nose measures one-fourth, the nose one-fourth and the mouth and chin one-fourth. The distance vertically from the root of the nose to its lower border is equal to the distance from this point to the bottom of the chin. Of this latter distance one-half is occupied by

the lips and one-half by the chin. The nose, then, equals in length the lips and chin.

"The Normal Occlusion of the Teeth."—The six upper anterior teeth close over the six lower from a third to a half of the length of the latter. The lower second bicuspid occludes between the cusps of the two upper bicuspids; this is a point easily remembered. Each bicuspid and molar is antagonized by two of the teeth of the opposite jaw. The buccal cusps of the lower teeth close between the buccal and lingual of the upper, and the lingual cusps of the upper close between the lingual and the buccal cusps of the lower.

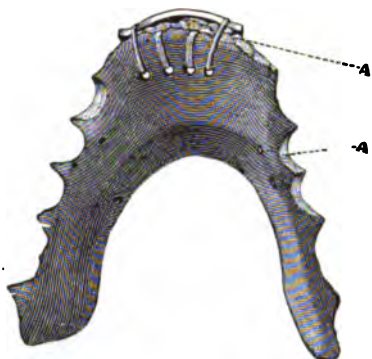


Fig. 17.—Plate with gutta percha extremities.



Fig. 18.

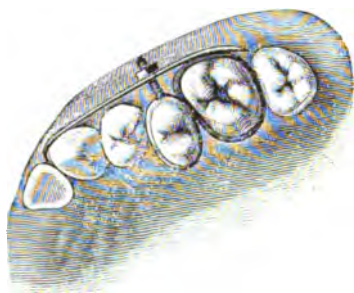


Fig. 19.

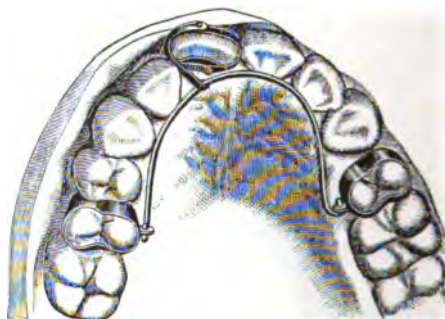


Fig. 20.

"As the lower moves laterally during mastication the cusps of the bicuspids and molars grind upon each other, while the six anterior teeth, overlapping but not touching, pass by each other and escape wear. In order to touch the cutting edges of the upper and lower incisors upon each other the lower jaw is protruded, and at such a time the masticating teeth do not occlude.

"In examining the upper six anterior teeth from the labial aspect it will be seen that they touch each other at one point only, about one-fourth of the distance from the cutting edge to the gum, and that the long axes of the teeth are not parallel but the crowns slant towards the median line. Of the six upper anterior teeth the central incisors are the longest, the laterals next, and the cuspids

shortest, though properly the cuspid is thought to be the longest tooth because of its prominence and the length of its cusps. It will be noticed that the gum line is higher on the cuspid, thus adding to its apparent length.

"A line connecting the cutting edges and cusps of half the upper teeth forms a double curve, highest at the third molar and lowest at the central incisor, the line of beauty, while such a line on the lower teeth forms but one curve, highest at its ends.

"While the aim of the student of orthodontia will be to correct all irregularities, and reduce the abnormal to the normal, it will be possible in many cases to do this only in degree. The normal may always be approached, but not always attained.

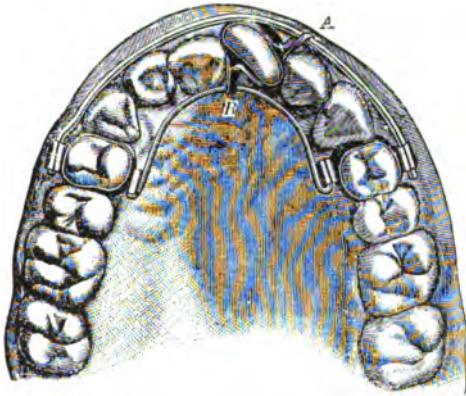


Fig. 21.

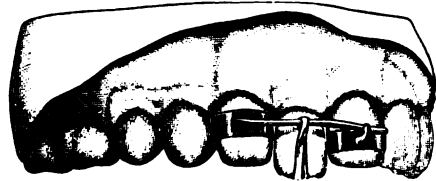


Fig. 22.

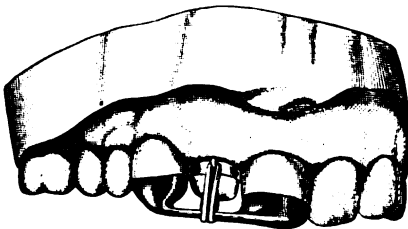


Fig. 23.

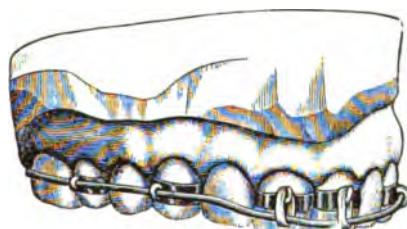


Fig. 24.

"The following *Classification of Irregularities* was suggested in the above book.

Aberrations from the normal arch are almost numberless, but may be grouped into classes as follows:

1. Lingual displacement: a tooth inside the normal arch.
2. Labial displacement: a tooth outside the normal arch.
3. A tooth rotated.
4. A tooth extruded.
5. A tooth partially erupted.
6. Several teeth in any or all of these positions.
7. Prominent cuspids and depressed laterals.

8. Pointed arch. (V-shaped.)
9. Upper Protrusion.
10. Double Protrusion.
11. Constricted arch. (Saddle-shaped.)
12. Lower protrusion, or prognathism.

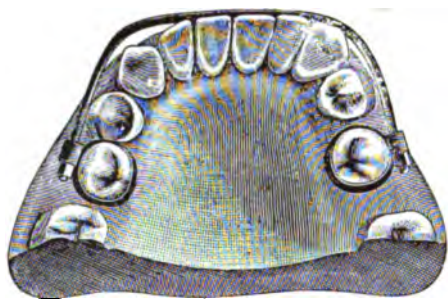


Fig. 25.

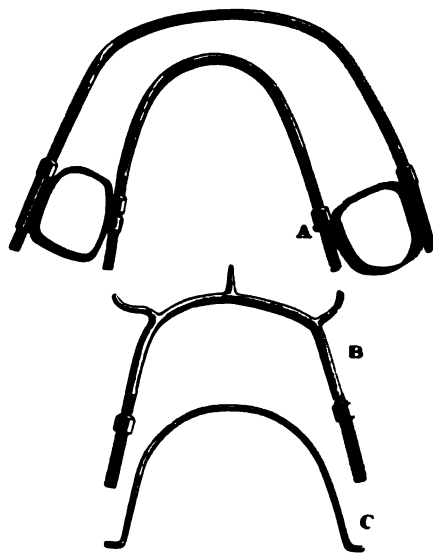


Fig. 26.

13. Lack of anterior occlusion.
14. Excessive overbite.
15. Separation in the median line."

Figs. 11 to 26 are taken from *Goddard's* article and will describe themselves.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

The Investing Tissues and the Extraction of Teeth. F. D. Lamb. The British Dental Journal, 1920, xli, No. 15, p. 701.

The author points out the desirability of giving attention to the alveolus and gingival tissues following the extraction of teeth, to promote the comfort and repair of the tissues, the correction of deformity, and to facilitate the adaptation of dentures. Under local anesthesia, the alveolar bone can be trimmed by nibbling forceps in a few minutes, hastening substantially the insertion of dentures, facilitating their effective adaptation, controlling the ridge form and to some extent shaping it at will. The prosthetist is well aware that the broad and massive ridge with external undercuts and bony prominences is not the best for his purpose, either for retention or for strength in the denture itself, and appreciates the value of surgical control of the ridge. The lower incisor region is often a source of worry to the prosthetist, due to the forward bending of the alveolus by the slowly inclining teeth, resulting in an unfavorable condition for denture adaptation. If the alveolus is also removed when the teeth are extracted, such trouble should be eliminated. There are edentulous maxillæ to which the premaxillary gum tissue is loose and flabby and inimical to the stability of a denture. The surgical manipulation of the tissue to secure more uniform resistance is suggested. It is a frequent experience to find an upper molar showing extensive gum recession and alveolar absorption both palatally and buccally, and extraction of the tooth leaves an upstanding process centrally placed, over which there is no gum tissue to contract, the result being a painful area, healing of which is delayed. The nibbling forceps should remove the alveolus to a desired level. There are cases in which the application of silkworm gut sutures to lacerated gum tissues is to be recommended.

The Pathological Conditions of the Teeth as Shown by X-ray. H. J. Means. Ohio State Medical Journal, 1920, xvi, No. 3, p. 157.

Dental caries and dental work are the most frequent causes of alveolar abscesses, which are of very common occurrence. It seems to be a conservative estimate that between 40 and 50 per cent of individuals with devitalized

teeth will have one or more abscesses. The danger of alveolar abscesses lies in the insidious mode of onset. The usual course is a slow symptomless development, but the focal infection may be responsible for headaches, earaches and facial neuralgia. The only positive means of diagnosis is the x-ray and the only safe procedure is to examine every large filling, crown or bridge. The importance of good x-ray negatives cannot be overemphasized, and the correct interpretation of negatives requires familiarity with the fundamental principles of dental anatomy and pathology, in addition to a knowledge of ordinary Roentgen diagnosis. The x-ray holds first place in the diagnosis of septic conditions of the mouth. The blind abscesses which give no sign of their presence can be demonstrated in no other way. In chronic abscesses with a discharging sinus and pyorrhea the x-ray will give information as to the size and involvement of surrounding tissues which can be determined in no other manner. A dental x-ray examination is indicated in every case of chronic systemic disturbance or any infection of streptococcic or staphylococcic origin. Practically every disease having its origin from the pus-forming organisms may result from oral sepsis. The most constant organism found in alveolar abscesses is the *Streptococcus viridans*. The most important way in which infection from oral sepsis spreads is by metastatic infection through the blood and lymph channels; this is greatly facilitated by the peculiar character of alveolar abscesses.

The Relation of Teeth to General Health. Ch. H. Lawrence. Boston Medical and Surgical Journal, 1920, clxxxvii, No. 182, p. 443.

Dental sepsis undoubtedly is the cause of systemic disease in certain instances, and a careful examination of the teeth should therefore always be made, besides questioning the patient as to the pressure of dental symptoms. If the x-ray findings alone are positive, extraction of useful teeth should not be resorted to without due consideration, experience having shown that benefit is obtained in only a small number of cases. Moreover, the extracted tooth is not always as bad as apparently indicated by the x-ray. The fact must be kept in mind that mastication is an important part of digestion, and that disorder of nutrition may arise from lack of teeth. Anemia and disorders of digestion may be due in some cases to dental sepsis; in others, they are as surely caused by too radical extraction in its treatment. From the standpoint of cleanliness, artificial teeth should not be permanently fixed in the mouth. From the medical point of view, permanent bridge work and similar devices are not desirable. The relation of dental conditions to general health, although extensively discussed in the literature, is by no means thoroughly understood. Until more clinical facts are available, caution is recommended in promising results from the extraction of diseased teeth.

Calculus Formation in the Antrum of Highmore. Seidel. Archiv für Ohrenheilkunde, 1919-20, civ, Nos. 3 and 4.

The formation of calculi in the antrum of Highmore is rare. Calculi develop around foreign bodies, or through calcification of malignant or inflam-

matory polypoid new-formation. The pus after an acute or chronic inflammation of the maxillary antrum can also act as a foreign body, in the form of caseous, cholesteatomatous, or pseudocholesteatomatous masses. For the pathogenesis of one such case, the author propounds the theory of a developmental disturbance of the maxillary antrum, with persistence of the myxomatous tissue and subsequent calcification of the same. A later infection causes a tendency to the extrusion of these calculi. It is only through an accurate histologic examination of also the peripheral portions of calculi of the maxillary antrum that reliable information can be obtained as to the mode of origin in a given case.

Thrush in Children and the Biology of the Thrush Fungus. E. Steinert. *Zeitschrift für Kinderheilkunde*, 1920, xxv, p. 83.

Working in the German Children's Clinic in the Prague Foundling Asylum the author tried, without success, to elucidate the conditions under which the thrush fungus settles in the buccal mucosa. The reasons for the lodging of thrush in young infants are stated by most observers to be the relative rest of the infantile mouth, the dryness of the mucosa as a result of the relatively late establishment of the function of the salivary glands, as well as the acid reaction of the buccal mucosa. However, this does not explain the apparent irregularity in the number and gravity of the infections, especially as these requirements are met with by all infants, whereas, only a part are attacked, the exposure to infection being identical for all. A review of the literature does not answer the question, if the buccal catarrh which is present in children suffering from thrush, is a cause or a result of the thrush-infection, preceding or following it. Another doubtful point is the primary or secondary lodging, or participation, respectively, of the other bacteria of the mouth in the thrush-disease; also it is left an open question if a primary dyspepsia is required for the onset of thrush; finally, if the mere fact that an infant has thrush, permits a conclusion as to an existing disturbance of the intestinal functions. Two types of thrush could be established by the author; in part of the cases, a very consistent layer of thrush develops rather slowly in localities favorable to the lodging of the fungus, the transitional region between the mucosa of the cheeks and the jaws; spreading apparently by continuity and forming scanty or no metastases. At the end of three or four days, this layer becomes detached and disappears, also in the absence of any treatment. A different clinical picture is seen in dyspeptic or in cachectic children. After the buccal mucosa has become remarkably red and dry, with a strongly acid reaction, small white spots make their appearance rather suddenly and simultaneously in the domain of the entire mouth-cavity, at first presenting a distinctly stellate configuration in especially severe cases, later on forming a furry covering of the entire buccal mucosa and surface of the tongue. Thrush-infections originating in this way obstinately resist all local treatment and subside only very gradually, together with the improvement of the general condition. They indicate a grave lowering of the defensive forces of the buccal cavity or of the entire body. Transitional cases have also been

noted and in conjunction with the cultural findings in both types permit the conclusion that the same pathogenic agent enters into consideration in the two varieties of thrush. In twenty-six cases of thrush examined by the author in over one hundred cultures, only one very circumscribed variety of fungus was found, which presented different forms of growth in the various culture-media. Mutual inoculations showed the undoubted identity of the fungi and the great tendency of the parasite to adapt itself to the existing biological conditions of the culture-medium.

Block Anesthesia in Bucco-dental Surgery. J. Bercher. *La Revue de Stomatologia*, 1920, xxii, No. 5, p. 245.

When a liquid anesthetic agent is placed in contact with a nerve-trunk, the region innervated by this nerve-trunk becomes blocked, as it were, the entire area supplied by it being deprived of susceptibility to pain. The mouth, the teeth, the lower portion of the face receive this sensory supply from the trigeminus, by way of the superior maxillary and inferior maxillary nerves; so that anesthetic blocking in bucco-dental surgery must be directed toward these two nerve-trunks. Hence, their anatomical position and relations must be accurately understood; and this knowledge will permit an anesthetic solution to be placed in contact with the nerve-roots. The technic of these radicular injections is accessible to all operators; the anesthetics thus produced are perfect and devoid of danger. It is desirable for all dental surgeons to become familiar with the technic of these anesthetics and to utilize them frequently, without hesitation, for all the interventions of bucco-dental surgery. The indications for root anesthetics are very numerous, and their method of arresting sensibility should be extensively employed. It is applicable not only in cases of buccal surgery, such as tumors or bony lesions, but also in a large number of cases of dental surgery. Radicular anesthesia is recommended in difficult or multiple extractions, in pulpectomies, scraping or fistulas, and so forth. The author always resorts to radicular anesthesia for the extraction of wisdom teeth. Several nerve-trunks may be anesthetized in the same session, when this is necessary; for example, the two inferior dental nerves were anesthetized by the author for an operation concerning the mandibular symphysis. The anesthesia may be repeated on the day following the first intervention, or the succeeding days. The only contraindication may be found in the general condition of the patient, and more particularly, in a badly compensated heart lesion.

Root anesthetics, when carried out with a rigorous technic, yield perfect and constant results, failures being due solely to errors on the operator's part. The procedure should be frequently utilized, without becoming discouraged by an unsuccessful outcome, rather trying to discover the cause (Testing of solutions, modifications of a defective technic). The author's statistics show only three complete failures, in a considerable number of radicular anesthetics. One case concerned the blocking of the inferior dental nerve, in a soldier who had an old fracture at the angle of the jaw. Undoubtedly, in this instance, the nerve had been torn by the traumatism and had lost its normal

anatomical position, while nerve collaterals had had sufficient time to become established through anastomosis. In the other cases, the superior maxillary nerve was to be anesthetized, and the failure of the injection to produce anesthesia was here in all probability due to the solution having lost its anesthetic properties. With special reference to complications, the author never observed neuralgias or sensory disturbances following upon radicular anesthetics. The patient usually complains of some pain after the intervention, but this can be controlled by 0 gr 50 aspirin, and after a short rest, he will be enabled to resume his operation. Concerning the anesthetic solutions, cocaine and all its derivatives may be utilized for the performance of radicular anesthetics; the author accords the preference to stovaine and novocain. The necessary instruments consist only of a sterilized syringe of 5 c.c. and a fine platinum needle 7 to 8 cm. in length. It goes without saying that these radicular anesthetics must be applied under perfect asepsis and a strict technic. A well placed injection provides an anesthesia lasting from between one-half hour to three hours.

Intermittent Hydro-parotitis Caused by Dental Plates. Jarret. *Journal de Médecin et de Chirurgie Pratiques*, Paris, 1920, No. 99.

Hydro-parotitis is essentially characterized by a sudden swelling of the parotid gland, in patients wearing hard rubber plates, almost invariably appearing at the time of the first meal, rapidly increasing during the masticatory movements, and reaching a variable degree. The condition is accompanied by local tension and interference with the movements of the jaw, sometimes even by acute pain during the first half-hour, and may be mistaken for mumps, as in a case under the author's observation. Without being serious in itself, this affection distresses the patient on account of its appearance, recurrence, and duration, while the physician may be misled, too, under a wrong diagnosis. The glandular swelling may reach the size of a small orange, it extends in front of the mastoid process, embraces the posterior border of the ascending ramus of the mandible, and spreads over the external aspect of the masseter, as far as the posterior border of the buccinator. The distention of the gland is spherical and entirely independent of the skin, which is tense, but of a normal color. The onset of the trouble is usually during the first week that a denture is worn, but it may appear later, as the result of chewing hard, or irritating food, such as nuts, or in consequence of the penetration of hard granules, bits of bones, and so forth, between the gums and the plate. The hydro-parotitis rarely manifests itself on the day of the excoriation, but follows two or three days later, the inflammation of the tissues requiring a certain time to become propagated as far as the meatus of Steno's duct. From now on the condition develops very rapidly, within some minutes, whereas, its subsidence requires a much longer time. The swelling may persist during entire days, but usually tends to disappear more or less completely in the afternoon, returning on the next five or six days, or longer; after this time it ceases, only to return at the end of a month or six weeks, in connection with a cold, or congestion of the buccal mucosa through irritative foods, and kindred causes. The attacks may thus recur during many months until the mucosa has

become completely accustomed to the plate. In the interval of the acute disturbances, there remains a certain induration, sometimes even a slight swelling of the diseased gland. A cure can always be obtained through the omission of the prosthetic apparatus in the first place, and its careful readjustment, combined with a few irrigations with potassium chlorate. Aside from the cases due to dental plates, hydro-parotitis has also been known to follow the employment of iodine or cauterization of the cheeks and is sometimes associated with a bad condition of the teeth and gums.

Dental Infection. Sinclair Tousey. *New York Medical Journal*, 1920, cxii, No. 11, p. 353.

The author emphasizes the fact that a great variety of symptoms are known to have dental infection as their frequent, common, or even usual cause. These symptoms are as manifold as the different organs to which the blood carries the poison from a dental abscess, and include high blood pressure with a tendency to result in arteriosclerosis, neuritis, neuralgia, and also various eye troubles; indigestion, ulcer and cancer of the stomach, cancer of the gall-bladder, etc. Skin diseases and insanity are in many cases due to dental infection. Many of the different diseases and symptoms, if taken in time, have been shown to be curable by the eradication of the focus of infection. It is noteworthy that pathogenic germs are often found in the vital pulps of teeth affected by pyorrhea or having carious cavities. The x-ray has often demonstrated extension of pyorrhea from an infected retained root as the cause of destruction of the alveolar process of a neighboring tooth. It has long been known to the author that a vital tooth may show periapical infection and he has made a radiographic diagnosis of periapical infection in teeth which were vital, some with and some without pain. The most difficult cases to decide about for the dentist are the cases of a vital pulp without pain or swelling, but with unmistakable x-ray evidence of periapical abscess. An infected root canal and an infected periapical space causing systemic infection do not necessarily involve any marked change in the gross appearance of the extracted tooth. The putrescent pulp of a tooth may poison the system through the apical foramen without any necessary change in the gross appearance of the root. The gravity of a given dental infection is sometimes shown by the severe reaction following upon extraction of the tooth, or opening of the abscess through the root canal. It is therefore advisable not to treat more than one or two foci at the same time.

Plastic Operations for Total Defects of the Chin. Th. Voekler. *Deutsche Zeitschrift fur Chirurgie*, 1920, cliv, p. 145.

The correction of total defects of the chin is practicable in two ways by means of genuine double skin-flaps, either by the chest-arm method, as originally employed by the author, or by the chest-wall flap method. The latter meets all requirements so completely that the first, more complicated and inconvenient method, should now be entirely abandoned. The chest-wall flap method is not only a complete double skin method, but it also provides more material, espe-

cially for the covering of the soft parts of the lower chin, which are often extensively destroyed in these cases. A long rectangular flap, having the width of the defect is excised, with its base in front of the clavicle. The flap is turned back at its end, for the purpose of double skin covering, and the cutaneous margins are fixed together through fine silk sutures. In order to guard against necrosis of the flap, the excision in its definite length is performed in several sessions, at intervals of about eight days. The last addition to the flap is invariably made in the same session in which the implantation takes place, so as to provide a sufficient nutrition of the flap by its immediate transference into healthy tissue with a good blood-supply. The graft is left connected to the chest at its base and is sutured into the defect. At the end of three weeks, the base of the flap is divided, leaving a longer or shorter segment, according to requirements in a given case. It is a decided advantage of this method that enough material directly connected with the graft is always obtainable for the covering of defects reaching far down toward the neck. A series of cases were successfully operated upon, in which the missing soft parts of the chin were thus replaced by a flap taken from the chest and turned back at its free border.

Surgical Treatment of Defects and Pseudarthroses of the Lower Jaw. R. Eden. *Sammlung Klinischer Vorträge*, 1920, No. 773.

The experiences furnished by the World-war in the treatment of maxillary pseudarthroses and defects of the jaw are so numerous and variegated that at this time a definite verdict seems possible concerning the different procedures and their application. The development of mandibular surgery has been essentially influenced by Lexer and his clinics, the author being enabled to report sixty cases operated upon in part by Lexer and in part by himself. Upon the basis of their joined experience, bony suture with wires is rejected, as is also the implantation of foreign bodies as substitutes for the defect. The only substitute entering into consideration is the autoplasmic periosteum and bone graft. Local anesthesia is sufficient for the exposure and preparation of the maxillary stumps and for the removal of the graft. Lexer was the first to describe the formation of two periosteum pockets at the ends of the defect, into which the graft can be fitted without requiring a special attachment. On account of the latent infection, especially after gun-shot injuries, suppuration cannot always be avoided, but it can be controlled without loss of the graft, provided timely and sufficient drainage is instituted. In certain cases presenting special technical difficulties, the entire middle segment of the mandible has been reconstructed, or a new skin has been built from a graft taken from the tibia. In other cases, the ascending ramus, together with the articular end, has been replaced by a segment of rib, its rounded cartilaginous portion serving as the articular capitellum.

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EDITORIALS

The Responsibility of the Exodontist in Relation to Orthodontics and the Public

AS DENTISTRY develops a greater tendency to divide into specialties, it necessarily follows that the men engaged in the various specialties assume a different relation to the public than does the general practitioner. Of course, the general dentist has a great responsibility in his duty to the public, but the manner of fulfilling it is slightly different from that of the specialist. The family dentist has only to satisfy himself and his patient by the exercise of his best judgment. We are willing to admit that the judgment of a man or the execution of that judgment may be faulty, but if he has done his work to the best of his knowledge, he cannot be held as having failed entirely. The man who errs through lack of proper knowledge cannot be held as liable as the man who possesses the required knowledge and still does what he

knows to be wrong, regardless of his reason for so doing. We know of several instances in which exodontists have been requested by general practitioners to do something that they (the exodontists) knew should not be done. This proves that the responsibility of the exodontist to the public is often greater than is generally recognized.

A specialist is supposed to be an expert in the branch of work in which he is engaged. While preparing for his specialty, he becomes the possessor of considerable knowledge of correlated subjects, and while this may not enable him to do his own work any better, it certainly points out to him the bearing his work may have upon other branches of dentistry, and it influences him to look out for the future welfare of the patient. Our attention has been called to the relation of the exodontist to the public by several things that have recently occurred.

When exodontists are considered, they must be divided into two groups. We are going to admit without any argument that all exodontists exist for the purpose of extracting teeth, but we find one class of these specialists existing *only* for the purpose of extracting teeth at so much per tooth. These men lose all interest in the patient's future welfare as soon as the tooth is out. They who are only interested in exodontia from the purely monetary standpoint do not admit that they owe anything to the profession or the public save the extraction of the tooth marked on a card or desired extracted by the patient, regardless of what other branches of dentistry may think of the future demands for the tooth as a part of the dental apparatus. These men extract teeth because some one has referred the patient to them, then they try to switch the responsibility to the dentist, even when their knowledge as a specialist indicates that the tooth should not be extracted. These exodontists justify themselves by saying that they must get their business from the medical and dental professions and therefore cannot afford to take the chance of giving the patient the benefit of their wide experience by suggesting anything that the general practitioner has not ordered. Specialists who shirk responsibility like this are a greater detriment to the profession than those who err because of lack of knowledge.

Fortunately there exists another group of exodontists who are working for the professional advancement of their specialty by placing the interests of the dental profession and the public above the mere gaining of wealth. There is no question in our minds but that the second man will eventually outstrip the first, even in the gathering of wealth, and will occupy a better social position in the community because he has given his best. We believe there are enough men in the dental profession sufficiently interested in the welfare of the public to refer business to the ethical exodontists, so that these specialists can serve the public as it should be served, without sacrificing their better judgment. The slogan of a certain club is "He serves most who serves best," and this applies particularly to the specialty of exodontia and the man who puts the interests of the public foremost.

Many times an exodontist is placed in an embarrassing position when he is requested to extract a pulpless tooth, as this is more or less a disputed point, and it is probably the most diplomatic thing to follow the advice of

the dentist who referred the patient, even though everything else would indicate that the tooth should be retained. It may happen that the opinion of the exodontist will not agree with that of the dentist, but as both will probably have reasons for their beliefs, and as the patient has placed himself in the hands of the dentist, the responsibility for the extraction of the tooth is really a question for the patient and the dentist to decide. However, in some branches of dentistry we find that there have been certain fundamental facts established which are accepted by all as being the basis for procedure in certain cases. We refer to the responsibility of the exodontist in relation to orthodontics.

The relation of the exodontist to those patients who require or may require orthodontic treatment at a later date is one that needs careful consideration. A patient is referred to the exodontist by the dentist, the exodontist performs the service, and several years later when the patient desires orthodontic treatment, the orthodontist finds that the exodontist did just what should not have been done.

There are men in the dental profession who pay no particular attention to orthodontia, neither do they take time to inform their patients of the necessity for orthodontic work or the benefits to be derived therefrom. As a result of this lack of interest in orthodontia, we find a number of men still extracting teeth for the correction of malocclusion. This includes the extraction of laterals, canines, and first molars, and is advised for children eight and nine years of age! The majority of exodontists know that such treatment as the extraction of anterior teeth for the correction of malocclusions is wrong and little less than criminal malpractice; therefore the exodontist immediately is given a responsibility, which may not be particularly to his liking, but which, we are glad to say, a few of them have assumed in spite of the unpleasant factors that have arisen therefrom. The exodontist who refuses to extract permanent teeth because some dentist has advised it is rendering the patient a great service, but he is also incurring the ill will of the dentist whose advice he opposes. The advisability of the extraction of first molars when they are badly decayed and pulpless may present disputed points; however, the laws of occlusion are so well recognized that there are cases in which we can positively say that first molars that are not diseased should not be extracted. Some men are advocating the removal of all four first permanent molars for the correction of bunching of the anterior teeth. We have yet to see a case of crowded anterior teeth that would ever be benefited by the extraction of the first permanent molars. Some also advocate the extraction of first permanent molars if they possess a slight cavity, justifying the extraction by saying that the pulp may die at a future date and give trouble, and they also extract the remaining molar on the other side to produce harmony in the size of the arch.

Our attention was recently called to a case in which a dentist sent a patient to an exodontist to have the first permanent molars extracted to relieve bunching of the anterior teeth; only one of the first molars was decayed at all and the cavity did not involve the pulp. The exodontist possessed some knowledge of orthodontics and told the patient that there must

be some mistake. Being unable to get in touch with the dentist over the telephone that day, the exodontist did not extract the permanent molars but removed some badly decayed and abscessed deciduous teeth, which the dentist had not ordered extracted. Later, the dentist became very abusive to the exodontist and informed him that when a patient was referred for extraction, it was not the exodontist's business to use his own judgment, but to do what he was told to do. There are a great many dentists who hold a similar opinion, even when they advise something that the majority of the profession know to be wrong. The exodontist wishing to do the best thing for the patient has a responsibility forced upon him which is not very pleasant if he wishes to keep the good will of the dentist.

The responsibility of the exodontist to the public is a factor that has not been recognized by the dental profession, or the exodontists as it should be, and it will have to be given more consideration in the future if exodontists are to render a real service to the public. Recognized standard methods of procedure must be adhered to regardless of the wish of the dentist who has referred the patient for some service (like the extraction of a normal anterior tooth) which should not be rendered. The possibility of orthodontic treatment extends over a considerable period of a patient's life, and mal-occlusions can be started through minor errors. These are things that the exodontist should remember before he does irreparable injury.

Exodontia is more closely related to orthodontics from the standpoint of the welfare of the patient than some might imagine. It should always be remembered that the extraction of teeth has a great bearing on the patient from an orthodontic point of view. The best thing for the patient should always be the ideal of the dental profession.

Erratum

In the November, 1920, issue of the Journal, the article by Dr. M. N. Federspiel entitled "A Report of a Case of Otitis of the Mandible with an External Fistula Caused by a Suppurative, Proliferative Pericementitis of a Lower Right Third Molar" should have appeared under the Department of Oral Surgery and Surgical Orthodontia, instead of the Department of Dental and Oral Radiography.

ORTHODONTIC NEWS AND NOTES

The editors desire to make this department a permanent feature of the Journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

Annual Meeting of the American Institute of Dental Teachers

The next annual meeting of the American Institute of Dental Teachers will be held at the Claypool Hotel, Indianapolis, Ind., January 24th, 25th and 26th, 1921.

The program will contain much of interest in dental teaching methods and dental educational affairs. A cordial invitation is extended to all ethical practitioners and others interested along these lines to attend the sessions.

DR. ARTHUR D. BLACK, President.

DR. ABRAM HOFFMAN, Secretary,

381 Linwood Ave., Buffalo, N. Y.

Meeting of the American Society of Orthodontists

The next meeting of the American Society of Orthodontists will be held at the Ambassador Hotel in Atlantic City on May 4, 5, 6, and 7, 1921. An invitation is extended to all who are interested in orthodontia.

J. LOWE YOUNG, D.D.S., President.

RALPH WALDRON, D.D.S., Sec.-Treas.

Alpha Omega Dental Fraternity

The Alpha Omega Dental Fraternity will meet in convention on December 26, 27, and 28, 1920, at Baltimore, Md. For full information address the Supreme Scribe, Dr. S. H. Bomenblit, 2459 N. 16th St., Philadelphia, Pa.

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¹Billings, J. S.: Our Medical Literature, Trans. VII Intern. Med. Congress, Lond., 1881, i, 54-70.

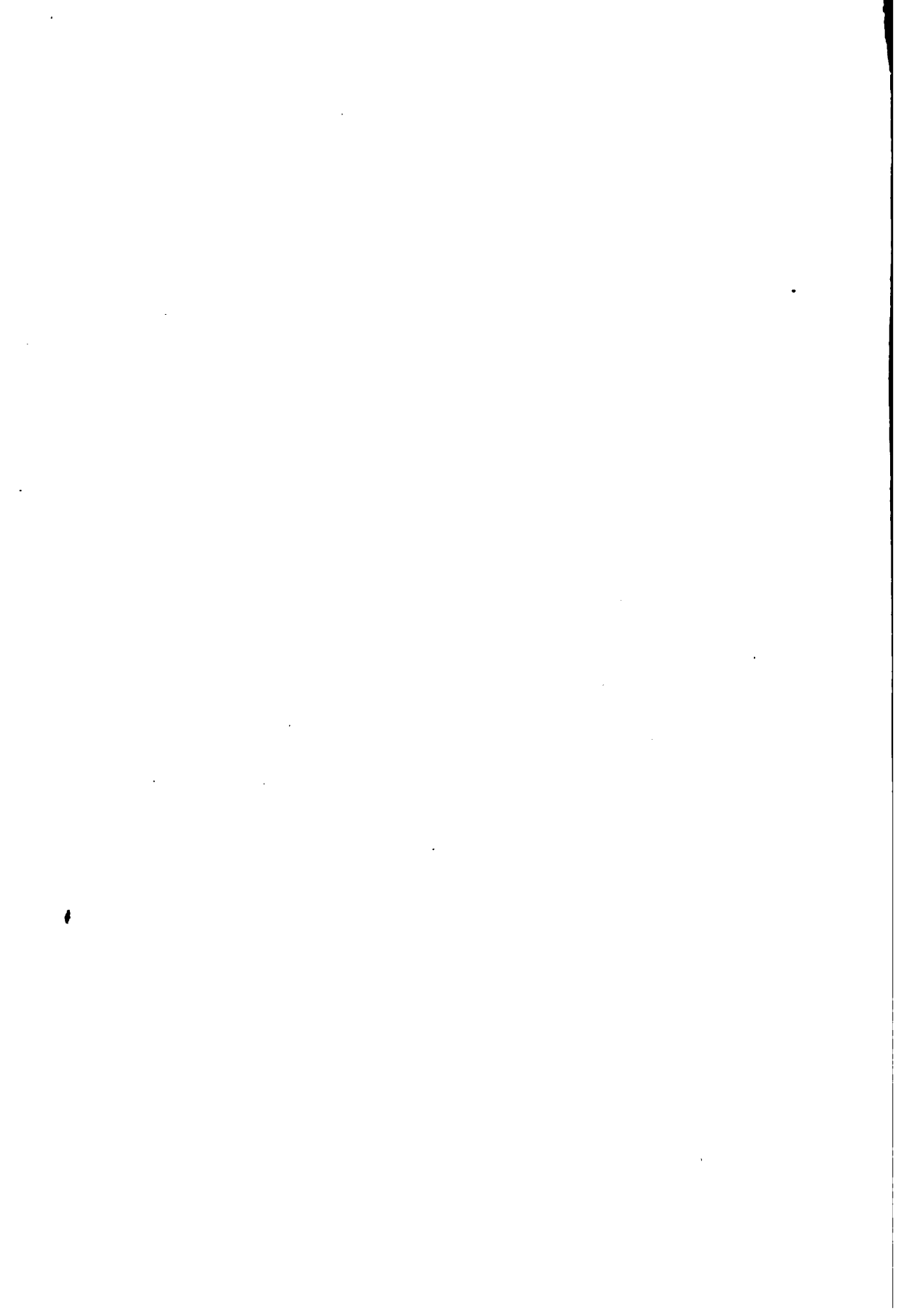
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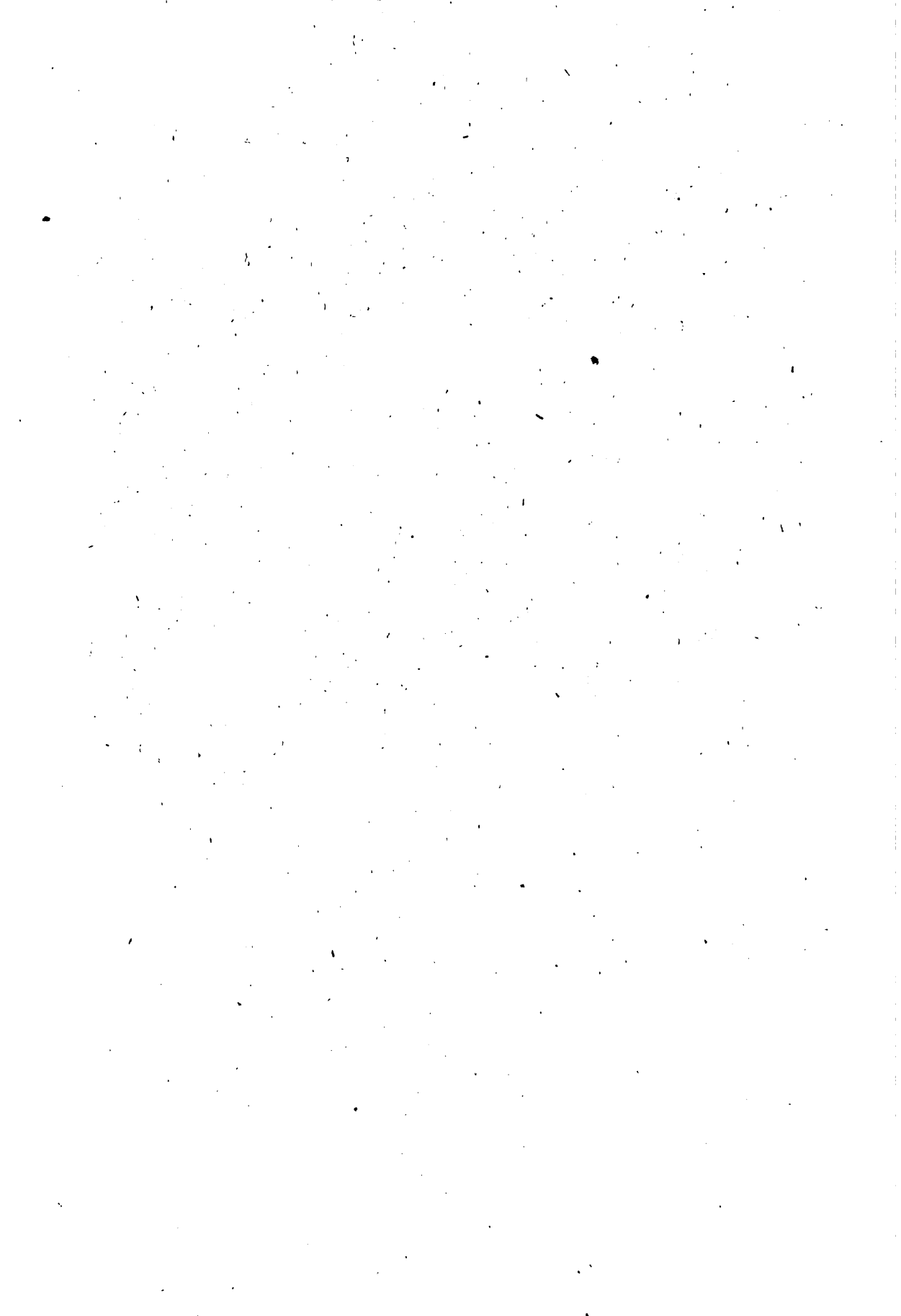
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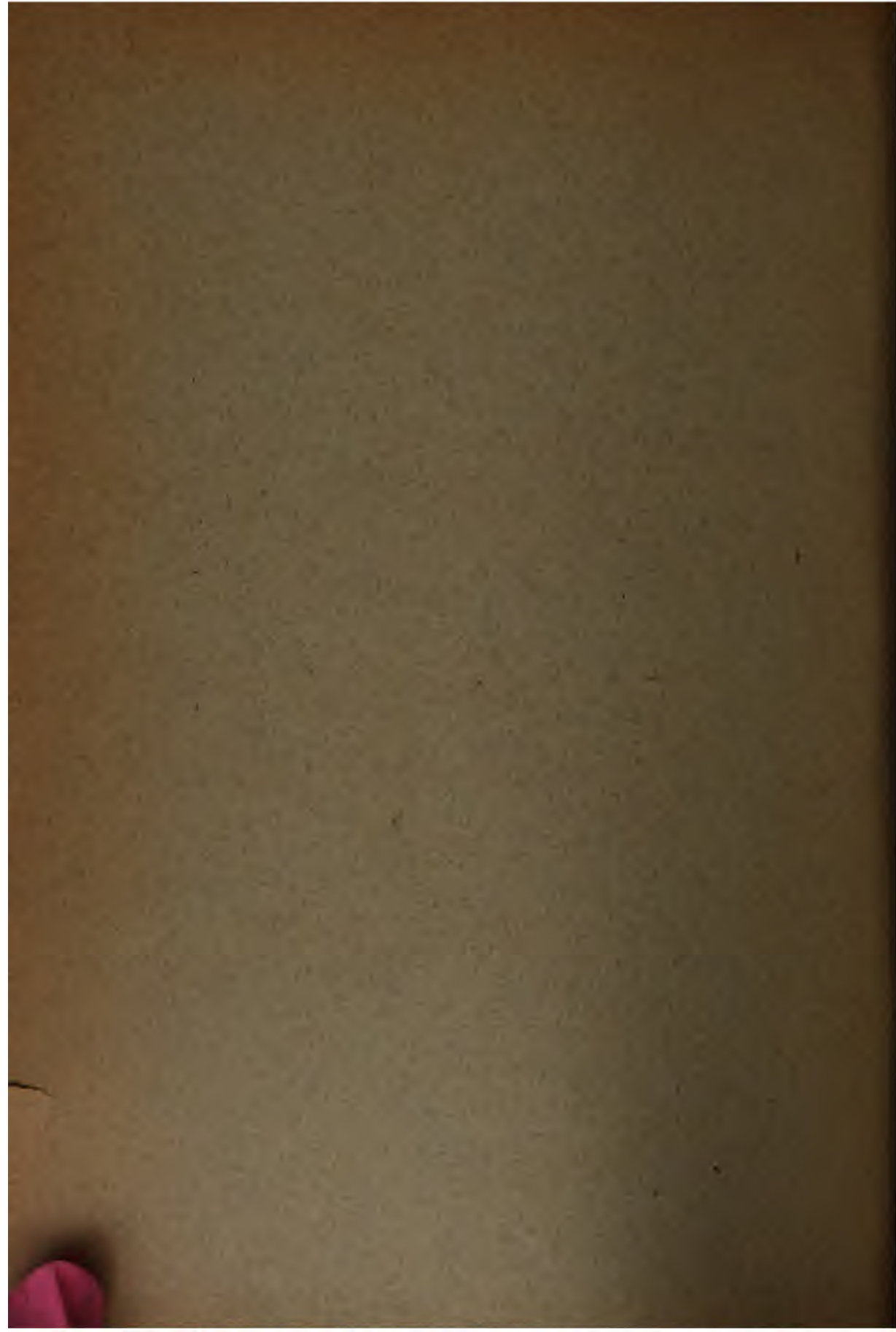
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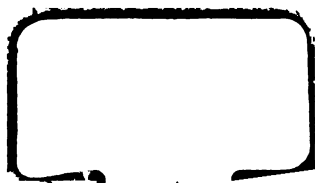
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